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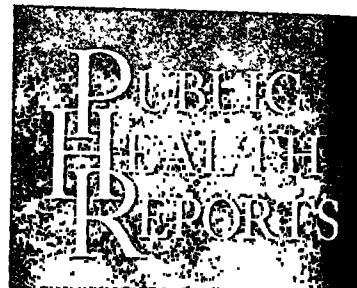
## **frontispiece**

The small boy with cholera was one of thousands stricken by the disease in Bengal in 1958. (See report on the epidemics of cholera and smallpox in East Pakistan, pp. 26-36.)



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U.S. DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE

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PUBLIC HEALTH SERVICE

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*Described as a valuable administrative tool, a system of gathering statistics on health services is outlined in relation to health department programs.*

## Health Service Statistics Record System

DORIS L. DUXBURY

HEALTH departments are constantly coping with the problems of insufficient money and people to carry on their present programs; at the same time, the rapidly growing population is making demands for new and increased health services. Facts concerning past and present services to the current programs are sorely needed as a means of evaluating past services, redesigning current operations, and determining priorities for the future. How can we obtain these facts in a simple manner?

Most public health workers are already overburdened with recordkeeping, and we need to be very cautious about adding to this load. However, many of the present recordkeeping systems are designed to provide specific information regarding a certain program without thought of relating it to other information concerning the same program or to other programs.

The scope of public health services is continually broadening, and more and more disciplines are represented on the staffs of health departments. The result is that no one program is conducted solely by one organizational unit of the department, but rather through the co-

operative effort of many disciplines from several program units. For example, usually the tuberculosis services of a health department include the work of not only the tuberculosis division but also other divisions such as nursing, nutrition, education, social service, and environmental health. This interdependence of disciplines is increasing rather than decreasing, and as it increases so will the need increase for interrelated statistics. To collect service statistics from several units concerning a single program is both a necessity and a problem.

For some time, statisticians of the Michigan Department of Health had been disturbed by the lack of service statistics compiled by program and had recognized a need for a system to provide these data on a departmentwide basis regardless of organizational units. A new system began in the Michigan Department of Health the day the chief of the nutrition section came to the statistical methods section for help with the reporting system for her section. She commented that the daily reports were time consuming to tabulate, and once counted had little meaning for they could not be related to each other and, consequently, were of little value for program planning or evaluation. The nutrition section seemed a logical unit for a pilot study in the use of a new system. There were only five members on the staff, and they

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were carrying on a type of program which provided service to practically all other major health department programs.

### Basic Record

The first step toward establishing the new system was to determine the type of basic record to be used. It was recognized that it must be a simple one in order to obtain complete and accurate reporting. This, together with the availability of IBM tabulating equipment in the department, resulted in the selection of the IBM mark sense card, designed to be used as the basic record for collecting and tabulating the data (fig. 1).

The fieldworker carries with him a small supply of these cards and a special IBM electrographic pencil. He records the services he gives by means of a few pencil marks on these cards; one card is used per activity according to the codes, all of which are indicated on the front or back of the cards with the exception of the geographic area code. Thus, only one code needs to be carried by the worker and since many workers provide services within limited geographic areas, they soon become familiar with their individual area code numbers. The completed cards are transmitted to the statistical methods section where they are mechanically punched in preparation for the required tabulations. Because mark sense cards are punched mechanically, their use eliminates the process of manual punching which would be required if any other type of record were used. However, where the volume of cards is small and IBM equipment is not available, the system is well suited to a marginal punchcard.

### Information Recorded

This card provides for the recording of the following kinds of descriptive and identifying data concerning services:

*Health department program* (columns 25-27). Service consultants frequently provide services to more than one program during a single conference or other activity. For that reason, three identical program columns have been provided allowing for the recording of as many as three different programs served

during any one activity. For example, an individual conference is held with one person during which maternity, child health, and chronic disease problems are discussed. In this instance, the one person receiving service would be recorded as one in the "number in attendance" columns. In the program columns, all three programs are indicated: maternity would be marked in one program column, child health in the second, and chronic diseases in the third. However, there is no significance to the sequence of the three program columns; the marking of these three programs in any other sequence would be equally acceptable.

This method of recording makes it possible to obtain two types of counts; a count of total persons served without regard to programs and a count of persons served in each program. Machine tabulating procedures make it possible to count this person once in each of the three program columns and once in the total column (table 1). In other words, the total column refers to total persons served, some of whom may have been served in more than one program. Because a recipient frequently receives service related to more than one program, the sum of the persons served in each of the programs is usually greater than the total number of persons served. From these two types of counts, it is possible to obtain valid percentage distributions of services by program (table 4).

*The geographic area* (columns 19-21). The geographic code refers to the location of the recipient of the service. It identifies the following: individual counties, a few special cities, regions of the State, the State at large, the United States other than Michigan, and foreign countries.

*The agency* (column 18). Agencies with which the recipient of the service is associated are identified according to the local health department, hospital, private organizations, and other State agencies.

*Personnel category* (columns 16, 17). To record the work of the recipients, certain categories of personnel are identified by the code on the back of the card. Additions have been made as new programs have been included in the system.

Figure 1. Front side of mark sense card used by the Michigan Department of Health<sup>1</sup>

										RECIPIENTS OF SERVICE										PROGRAM							
										MONTH	WKR.	ACTIV	UNIT	CATEGORY OF PERSONNEL	AGENCY	AREA		NUMBER IN ATTENDANCE	IDENTIFICATION WITH SERVICE								
																COUNTY	CITY		C B	C D	C D						
0000000000	0000000000	0000000000	0000000000	0000000000	0000000000	0000000000	0000000000	0000000000	0000000000	0000000000																	
												CONF	INDIV		HOSP					MAT	MAT	MAT					
1111111111	1111111111	1111111111	1111111111	1111111111	1111111111	1111111111	1111111111	1111111111	1111111111	1111111111		TALK	GROUP		INSTN					CH H	CH H	CH H					
2222222222	2222222222	2222222222	2222222222	2222222222	2222222222	2222222222	2222222222	2222222222	2222222222	2222222222		INST			GR SCH					T B	T B	T B					
3333333333	3333333333	3333333333	3333333333	3333333333	3333333333	3333333333	3333333333	3333333333	3333333333	3333333333		INSP			COLLG					V D	V D	V D					
4444444444	4444444444	4444444444	4444444444	4444444444	4444444444	4444444444	4444444444	4444444444	4444444444	4444444444		TRAIN			WELF					CHR D	CHR D	CHR D					
5555555555	5555555555	5555555555	5555555555	5555555555	5555555555	5555555555	5555555555	5555555555	5555555555	5555555555		CASE F			COL AGNCY					DENT	DENT	DENT					
6666666666	6666666666	6666666666	6666666666	6666666666	6666666666	6666666666	6666666666	6666666666	6666666666	6666666666					INDUS					OCC H	OCC H	OCC H					
7777777777	7777777777	7777777777	7777777777	7777777777	7777777777	7777777777	7777777777	7777777777	7777777777	7777777777		GR STU			PRIV					ENV H	ENV H	ENV H					
8888888888	8888888888	8888888888	8888888888	8888888888	8888888888	8888888888	8888888888	8888888888	8888888888	8888888888		APPRN	OTHER		GEN ST AGNCY					GEN	GEN	GEN					
9999999999	9999999999	9999999999	9999999999	9999999999	9999999999	9999999999	9999999999	9999999999	9999999999	9999999999																	
1 2 3	4 5 6	7 8 9	10 11 12	13 14 15	16 17 18	19 20 21	22 23 24	25 26 27	28 29 30	31 32 33	34 35 36	37 38 39	40 41 42	43 44 45	46 47 48	49 50 51	52 53 54	55 56 57	58 59 60	61 62 63	64 65 66	67 68 69	70 71 72	73 74 75	76 77 78	79 80	
MICHIGAN DEPARTMENT OF HEALTH																											

<sup>1</sup>The back of the card lists categories of personnel by numerical code.

*Number in attendance* (columns 22-24). Space is provided for recording as many as 999 in attendance or recipients of service per activity.

*Activity* (column 14). Activities have been classified in broad terms with the idea of making them applicable to all health department programs; they are conference, talk, institute (workshop), inspection, training, casefinding, and other. The number of each category of activity is obtained by a simple card count since one card is recorded for each activity. The number of people served by these respective activities is the sum of the numbers recorded in the columns for number in attendance.

*Servicing unit* (column 15). This column serves as a subdivision of the activity column and makes it possible to differentiate between individual and group activities.

*Identification of service worker* (column 13). The code used for the worker is a four-digit number representing the health department position which the worker is currently filling. Since this number remains constant until the position is abolished, the number does not change with a change in staff, and, therefore, gives continuity in reports. This number is so

constituted that the division, section, and unit of the department are identified by the first three digits, which are prepunched in specified columns of the cards leaving only the fourth digit for the worker to record to identify himself. This makes it possible to combine cards from all divisions of the department and still be able to identify the division, section, unit, and worker in tabulations of total health department services. Thus, a tabulation by program and the first three digits of the position number indicates the amount of service each division, section, and unit of the health department contributes to the total services in each program (table 2). Tabulations using the fourth digit of the position number provide summary tabulations of each individual worker's services (table 3).

*Month of service* (columns 11, 12). Only the month is marked by the worker; the last digit of the year is gang punched in a specified column for all program cards when received in the statistical methods section.

The items which have been discussed so far are believed to be applicable to all health department programs. For that reason, the terms used have been made as broad as possible.

However, some of the programs have certain types of services peculiar to their own programs which they also wish tabulated. We have reserved space for recording these items for the respective programs. One column is now used for special casefinding activities in the hearing program, and for special chronic disease information for nutrition and nursing. Other columns are used for hospital identification for the hospital consultation and the licensing section. This type of arrangement makes for uniformity, yet it is flexible enough to accommodate special program needs.

### **Purpose, Objective, and Philosophy**

The purpose of this record system is to provide a feasible method of collecting these service statistics and a flexible means of tabulating them. The objective is to provide meaningful service statistics for program planning, administration, and evaluation which will be useful to the individual worker, the program director, and the administrator.

The system is primarily concerned with the recipients of health department services, the number of Michigan people and others who received service from the professional fieldworkers of the Michigan Department of Health. The number of recipients is a count of persons to whom services have been given and is not necessarily an unduplicated count of individuals. The item of activity as used here serves to indicate the method or means through which these services are accomplished. A count of these activities is not for the purpose of determining the amount of effort put into the job by each worker; instead, it is a means by which the amount of services accomplished can be related to the various work techniques, individual and group.

Only activities which provide services are reported in this system. For example, attending a professional meeting without participating is not recorded because no service was given. However, if there was participation in the meeting, then a service was given and the activity is recorded together with the number of people receiving the service. The first instance is for professional advancement while the second is a service given. Likewise, interdepartmental

planning conferences are not recorded; it is a foregone conclusion that effective services cannot be provided without previous planning and counseling. Also the time spent providing these services is of no concern in this system. When the time element is important, it can be considered more appropriately through special time studies.

### **Development**

To establish the new system required several planning sessions over a period of time. In the beginning, several conferences were held between the chiefs of the nutrition section and the statistical methods section to determine types of data needed and the uses to be made of them. The statisticians met with the entire nutrition staff for an explanation of the philosophy and method of the new system. The staff assisted in defining terms and establishing rules for recording. Following this, the system was put into use. At the end of the first month, sample tabulations were run and summary tables prepared. These were jointly reviewed by the nutrition staff and the statisticians at the monthly nutrition staff meeting to which the director of the division of local health services and the director of the division of administration were invited.

Throughout the year, monthly tabulations were reviewed jointly with the nutrition staff at their monthly staff meetings. This continuing process provided a means of refining definitions and policies and developed a common understanding of the philosophy, problems, and methods of recording. At the end of the year, annual tabulations and summaries were prepared. Also, a few graphs were prepared showing the percentage distribution of nutrition services by program and by agency. This was the first time annual service statistics had been available on either a program or agency basis.

Again the directors of local health services and administration were invited for the review and expressed considerable interest in the value of these statistics to the department as a whole. The director of local health services said that the actual figure of total people served together with the subdivisions by program would be

seful in verifying the fact that the State health department had rendered specific services to certain individual health departments. The director of the division of administration felt that the figures by program would be useful in justifying categorical funds and helpful in making a more equitable distribution of them among the organizational units of the department.

At the end of the second year, annual summaries and charts were again reviewed. This time the charts were designed to compare the 2 years, keeping in mind, of course, the changes in size of staff. At the end of the third year, it was possible to prepare charts in the form of line graphs indicating trends and summary tables in the form of time series. At this point, it became possible to take a new look at the program from the standpoint of both the past and the future—in other words, to evaluate what had been done and set goals for the future. With 3 years' accumulation of data, the system took on new meaning and value for the program people.

During this period of development in the nutrition section, the director of the maternal and child health division suggested that this system be applied to some of her programs where a rather extensive code system of reporting was being used. Also, during this time, the system was reviewed by the Research and

Statistics Committee of the department composed of representatives of most of the health department programs. The representatives from local health services and administration were already familiar with its advantages and were helpful in conveying to the other members of the committee the advantages of the system to the department. The committee, including the director of the maternal and child health division, recommended that the system be extended to other organizational units. The director also suggested that the extension begin with three of her programs—hearing, vision, and hospital services. The statisticians then held meetings with the director of the maternal and child health division, her section chiefs, and staff members of these program units; these meetings were similar to those held with the nutrition section.

Not long after the system was underway in these programs, the chief of the nursing section requested that her program be considered next. Similar procedures of indoctrination were carried out with this section. Basically, the definitions and terms used for nutrition were acceptable to the other programs but needed to be related to the specific programs. It was obvious that the preliminary conferences and meetings with the nutrition staff were paying dividends. Relatively few changes have been necessary in the nutrition definitions and

Table 1. Report of nutrition services by agency and program, Michigan Department of Health, 1958

Agency	People served by program								
	Total	Communicable disease	Maternity	Child health	Tuberculosis	Chronic disease	Dentistry	Environmental health	General
Total.....	11, 448	11	1, 550	5, 743	122	4, 250	142	48	2, 702
X Multiple agencies.....	24	0	0	24	14	24	10	0	0
0 Local health department.....	2, 043	4	211	837	58	1, 143	65	46	590
1 ".....	962	0	252	141	25	220	0	0	597
2 ".....	656	0	0	208	0	474	0	0	226
3 Grade school.....	2, 918	0	2	2, 837	1	109	49	0	154
4 College.....	503	0	82	207	2	235	0	1	407
5 Welfare agency.....	178	0	5	88	1	93	0	0	12
6 Voluntary agency.....	389	0	72	37	3	113	2	0	206
7 Industry.....	1	0	0	1	0	1	0	0	1
8 Private.....	3, 362	6	863	1, 253	12	1, 629	16	1	397
9 Other State agency.....	412	1	63	110	6	209	0	0	112

NOTE: The column of numbers to the left of the agencies represents a numerical code used in tabulation.

**Table 2. Report of certain health department services by program, Michigan Department of Health, 1958**

Organization unit	Code	People served by program									
		Total	Communicable disease	Maternity	Child health	Tuberculosis	Venereal disease	Chronic disease	Dentistry	Environmental health	General
Total.....	-----	45,650	307	6,121	34,854	547	118	5,940	196	118	10,893
Nutrition.....	350	11,448	11	1,550	5,743	122	0	4,250	142	48	2,702
Nursing.....	360	6,380	294	839	2,495	418	118	1,687	54	61	4,365
Maternity and child health:											
Hearing.....	343	18,118	0	0	18,118	0	0	0	0	0	0
Vision.....	344	4,685	0	4	4,667	0	0	0	0	0	59
Hospital services.....	346	5,019	2	3,728	3,831	7	0	3	0	9	3,767

procedures. The problems ironed out with that program reduced considerably both the problems and time required to establish the system in these other programs. However, successive

adaptations to new programs have helped to sharpen the definitions and to clarify policies for all programs. Trends are now available for all of the five programs and the annual sum-

**Table 3. Nutrition services by worker, area, and program, Michigan Department of Health, 1958**

Service description						Program								
Worker No.	Geographic area	Agency	Personnel	Activity	Unit	Total	Communicable diseases	Maternity	Child health	Tuberculosis	Chronic diseases	Dentistry	Environmental health	General
						2,943	10	228	1,891	58	1,419	125	42	321
2	3	0	11	1	1	6			2		4			
2	3	0	13	1	1	9		4	6	1	1	1		
2	3	0	13	2	2	6					6			
2	3	0	15	1	1	3			1		2		1	
2	3	1	13	1	1	1					1			
2	3	1	21	1	1	3					3			
2	3	1	11	1	1	7					7			
2	3	2	11	2	2	3					3			
2	3	3	11	1	1	2			2					
2	3	3	21	1	1	2			2					
2	3	3	35	1	1	2			2					
2	3	5	11	1	1	1					1			
2	3	8	45	1	2	3					3			
*2	5	0	13	1	1	1		1	1		1			
2	5	3	21	1	1	3			3					
2	5	8	45	1	1	2		2						
2	6	0	13	1	1	2			2	1	1			
2	6	2	11	1	1	3					3			
2	6	3	21	1	1	12			12					
2	6	3	21	2	2	31			31					
2	6	3	34	1	1	1		1	1					
2	6	3	35	1	1	1			1					1

maries are becoming more and more valuable to the program directors each year.

#### Cross Tabulations of Data

Cross tabulations of the items in this system provide a wealth of information about health department services that have been given and all attention to the need for services where they have not been provided.

The cross tabulation of program and agency in table 1 shows the distribution of nutrition services to the various health department programs as well as to the several agencies. Similarly, for each program, there is a distribution of services by agency and for each agency there is a distribution by program. For example, the chronic disease services to 4,250 people represent well over one-third of all nutrition services; of these, 1,629, or 38 percent, were with private agencies; 1,143, or 27 percent, with local health departments; and 6 percent with colleges. Agencywise, hospitals received maternity, child health, tuberculosis, and chronic disease services as well as generalized nutrition services from the nutrition section.

Table 2 is a sample of a composite picture of health department services by program, the sum of the services contributed by each organizational unit. The sample includes the five organizational units currently using this system.

Table 3 gives a more detailed picture. It is a summary of the individual worker's services. From this, he knows how many persons he has served in each program by geographic area, agency, category of personnel, and by which method or activity these persons were served. For example, the line marked with an asterisk in table 3 is interpreted as follows: nutrition worker No. 2 held an individual conference with a local health department nurse in area 5 during which she provided service in relation to maternity, child health, and chronic disease.

Table 4 illustrates a continuing annual summary of the number and percentage distribution of nutrition services by program. The marked drop in services in 1954 is noticeable and was due to a decrease in staff. Since that time, some of the local health departments have employed nutritionists on their staffs with the result that fewer of the nutrition services to the State as a whole have been given by State-employed nutritionists. The increase in chronic disease service is also noticeable; this is the result of the recent responsibility of the health department for the licensing of nursing homes and homes for the aged.

Table 5 relates the number of activities to the number of people served and indicates the trend over the years. The services provided by means of conferences have consistently

Table 4. Recipients of nutrition services by program, Michigan Department of Health, 1953-58

Program	People served											
	1953		1954		1955		1956		1957		1958	
	Number	Percent	Number	Percent	Number	Percent	Number	Percent	Number	Percent	Number	Percent
Total	14,597	100	9,706	100	11,433	100	11,880	100	11,708	100	11,448	100
Communicable disease	18	0.1	16	0.2	18	0.2	0	0	5	0	11	0.1
Maternity	328	2.2	268	2.8	381	3.3	524	4.4	602	5.1	1,550	13.5
Child health	9,277	63.6	5,377	55.4	6,818	59.6	7,528	63.4	7,547	64.5	5,743	50.2
Tuberculosis	278	1.9	347	3.6	233	2.0	115	1.0	127	1.1	122	1.1
Venereal disease	0	0	0	0	0	0	0	0	1	0	2	0
Chronic disease	1,477	10.1	1,063	10.8	1,356	11.9	1,456	12.3	2,695	23.0	4,250	37.1
Dentistry	76	.5	26	.3	157	1.4	28	.2	26	.2	142	1.2
Occupational health	201	1.4	0	0	0	0	2	0	2	0	0	0
Environmental health	72	.5	152	1.6	4	0	6	.1	396	3.4	48	.4
General	4,413	30.2	3,114	32.1	3,741	32.7	2,900	24.4	3,014	25.7	2,702	23.6



**Table 5. Activities and people served through nutrition services, Michigan Department of Health, 1953-58**

Type of activity	1953		1955		1956		1957		1958	
	Number	Percent	Number	Percent	Number	Percent	Number	Percent	Number	Percent
Activity										
Total.....	2, 622	100	3, 072	100	1, 634	100	1, 635	100	2, 341	100
Conference.....	2, 164	82. 5	2, 789	90. 7	1, 326	81. 1	1, 381	84. 5	2, 035	86. 9
Talk.....	254	9. 7	143	4. 7	192	11. 8	147	9. 0	189	8. 1
Institute.....	65	2. 5	30	1. 0	27	1. 7	8	. 5	6	. 3
Inspection.....	135	5. 1	55	1. 8	65	4. 0	95	5. 8	82	3. 5
Training.....	2	. 1	39	1. 3	20	1. 2	2	. 1	27	1. 1
Other.....	2	. 1	16	. 5	4	. 2	2	. 1	2	. 1
People served										
Total.....	14, 597	100	11, 433	100	11, 880	100	11, 708	100	11, 448	100
Conference.....	3, 633	24. 9	4, 383	38. 3	4, 287	36. 1	3, 439	29. 4	3, 987	34. 8
Talk.....	7, 084	48. 6	5, 458	47. 8	6, 434	54. 2	7, 228	61. 7	6, 873	60. 0
Institute.....	3, 289	22. 5	1, 012	8. 9	882	7. 4	653	5. 6	247	2. 2
Inspection.....	532	3. 6	238	2. 1	153	1. 3	342	2. 9	138	1. 2
Training.....	10	. 1	325	2. 8	122	1. 0	9	. 1	98	. 9
Other.....	49	. 3	17	. 1	2	0	37	. 3	105	. 9

NOTE: Figures for 1954 not available.

ranged between 80 and 90 percent of all activities, serving between approximately 25 and 38 percent of the people. Although not shown in this table, it is possible to subdivide conferences into "individual" and "group" to further relate the activity to persons served and to indicate the amount of group approach.

Figure 2 shows the number of recipients of the various program services on semilogarithmic graph paper which indicates not only the relationship between the number of services in the several programs but also the rate of change in the number of services in each of the respective programs. The drop in tuberculosis services during 1955 and 1956 alerted the nutrition staff to the need for conferences with the staff of the tuberculosis division.

#### Uses

These service statistics are used for—  
 Special program reports.  
 Staff meeting discussions.  
 Program reviews, evaluations, and planning.  
 Developing and administering training programs.

In order to—  
 Orient new employees.  
 Write annual reports.

Point up areas for special studies and special program emphasis.

Justify increased budget and staff; distribution of categorical funds; and reorganization of program plan.

Indicate areas of progress and of need.

Evaluate local use of State consultants.

Determine services provided in areas of the State without health departments.

Provide information to legislative and budget authorities.

Monthly and annually, the program director receives a copy of the tabulation of total staff services and a copy of each individual worker's services. The individual worker also receives a copy of the total staff services but only a copy of his own individual services, not those of his co-workers. It is important that the individual worker receive a report of his services to provide him with the means of evaluating and planning his own work, as well as to receive something valuable and useful in return for his efforts of recording data. This makes him better able to see his services in relation to the total services of his organizational unit, a factor conducive to the team approach.

Reviewing monthly and annual summaries at

staff meetings is very valuable to the individual worker as well as to the program director because each worker has an opportunity to see the overall result of the combined efforts of the staff as well as his own contributions. This type of review also frequently serves as a self-correcting device. It is not uncommon for questionable figures to appear and after some discussion, it is discovered that there is lack of uniformity among the staff in recording their services. For example, it was learned that for services in nursing homes, some workers were coding them as "private" and some were coding them as "institutions." These examples of misplaced data due to miscoded reports are of tremendous assistance to the worker in helping him to more fully understand the categories of information which he is asked to code on the record. Knowing where he wants his efforts to appear in the

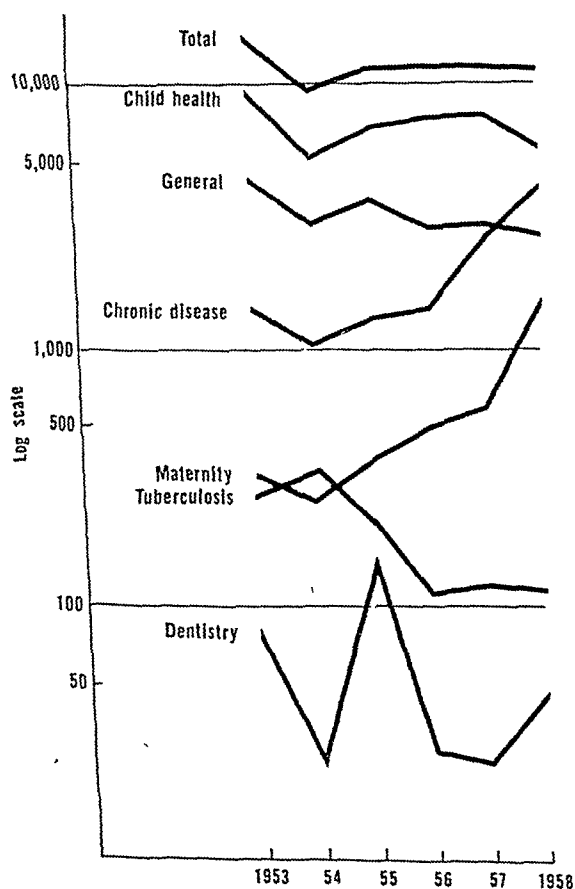
summary reports helps him to code his services more accurately.

These continuing annual summaries provide the program directors with data helpful not only for future planning but also for deciding emphasis in program operations. After 2 successive years of decreasing nutrition services to the tuberculosis program, the nutrition section assigned a graduate nutrition student the project of determining the reason for the decline in tuberculosis services and also to discover where these services were most needed in the program. This information also served as the basis for joint conferences with the tuberculosis and adult health division to review their total program with special concern for nutrition emphasis. This created an awareness of the services available from the nutrition section.

The nutrition section also makes extensive use of this information in State and local training programs. Their graduate students and trainees in local health departments also use this system to record their services and send them in to the State office, thus providing actual figures which are convincing evidence that trainees give a great deal of service while they are being trained. These factual data indicated that the nutritionist provides a departmentwide service to the local health department programs, thereby justifying the expenditure of money to establish a nutritionist position on the staff. So far, two local health departments have established nutritionist positions on their staffs. One of the local health officers requested from the State the service statistics of his nutritionist to include in his annual report.

The fact that the State health department also has the statistics from the local areas makes it possible to evaluate not only the nutrition services of the State staff but to have information concerning total nutrition services given within the State, by State and local health departments. In other words, the system provides a means of both selling and evaluating. More and more graduate schools are becoming concerned with training for supervisory nutrition positions. To date, three students have come to Michigan for supervisory field training. The interpretation and use of this system provided the basis for the most important part of

**Figure 2. Number of recipients of nutrition services by program, Michigan Department of Health, 1953-58**



**Table 5. Activities and people served through nutrition services, Michigan Department of Health, 1953-58**

Type of activity	1953		1955		1956		1957		1958	
	Number	Percent	Number	Percent	Number	Percent	Number	Percent	Number	Percent
Activity										
Total	2, 622	100	3, 072	100	1, 634	100	1, 635	100	2, 341	100
Conference	2, 164	82. 5	2, 789	90. 7	1, 326	81. 1	1, 381	84. 5	2, 035	86. 9
Talk	254	9. 7	143	4. 7	192	11. 8	147	9. 0	189	8. 1
Institute	65	2. 5	30	1. 0	27	1. 7	8	. 5	6	. 3
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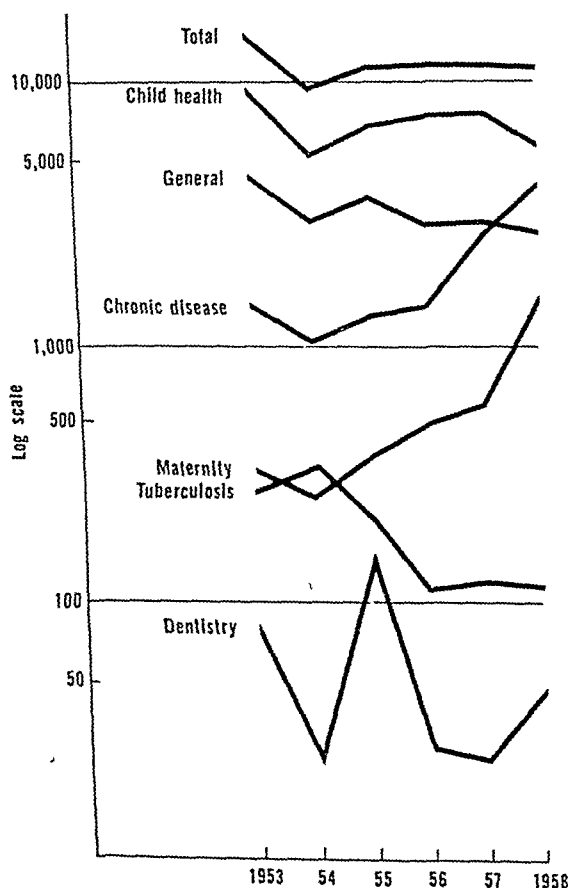
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**Figure 2. Number of recipients of nutrition services by program, Michigan Department of Health, 1953-58**



their training. It is a concrete constructive device to use in training and supervision and a tool which they can use in the future.

The first annual summary of the hearing program pointed up the volume of casefinding services and the proportionately small amount of consultant service. The maternal and child health director and hearing consultants had been aware of this situation and realized that consultants on the State level should provide more consultant service and do less casefinding. A bar diagram chart of these services pointed up the relationship very sharply and gave support to the hearing program's long-range plan for decentralization. Plans were made for further decentralization of casefinding activities. This resulted in many local health departments employing hearing conservation staff.

### Comments

Comments have been received from two program directors using this system to the effect that because they are accustomed to working with and thinking in terms of individuals, it is hard for them to think in terms of large numbers. This is particularly true of some of the people trained in the clinical field. They recognize the need for service statistics but find it difficult to know how to record them or how to think in terms of counting them. Once these data are summarized, related to each other, and presented in such a way as to indicate trends

over the years, they can readily relate past incidents and problems of their programs to the fluctuations in these trends. With this visual impression of the past, they can more readily visualize their future goals. Also, they are much more aware of the relative position that each part of their work contributes to their total program and are able to adjust their activities and program content according to their goals; for example, the people in the hearing program further decentralized their casefinding activities and the nutrition people took steps to increase their services to the tuberculosis program.

### Summary

As the scope of public health takes on new proportions, the number of public health disciplines increases and, consequently, a greater need arises for service statistics by program for health departments as a whole as well as by specific divisions within the department. These statistics are valuable not only for program planning and evaluation, including training programs, but as documentary evidence for budget requests, justification of categorical funds, and as an aid in making an equitable distribution of services and funds.

This account describes the development and use of a mark sense punchcard system for obtaining service statistics. With this system, collection of the data is simple and the tabulating possibilities are both multiple and flexible, providing useful information for the individual worker, program director, and administrator.

### Safety Leaflet for the Aging

"Getting on Safely," a leaflet to help aging men and women to avoid accidents, was recently published by the National Safety Council.

Among men and women over 65 years of age, the incidence of fatal and crippling injuries is relatively high. Three-fourths of all accidental deaths from falls during 1957 occurred in this age group.

A sample copy of the leaflet may be obtained free of charge from the National Safety Council, 425 North Michigan Avenue, Chicago 11, Ill. The minimum purchase order accepted is for 50 copies (\$2.80).

*Public health nurses discover an outbreak of staphylococcus in a New York State hospital nursery through a 10-month surveillance of newborn infants at home.*

## Staphylococcal Outbreaks in Infants Detected after Hospital Discharge

ANDREW C. FLECK, Jr., M.D., M.P.H., and MALCOLM BOUTON, M.D., M.P.H.

**I**N HOSPITALS in upstate New York, most newborn infants stay only 4 days. Since this stay is shorter than the average 6-day incubation period of hospital-acquired staphylococcal disease in newborns (1-6), a nursery outbreak may be detected only by examination of infants after discharge.

The feasibility of having public health nurses examine infants after discharge was explored during a 10-month survey in one city served principally by three hospitals. When the survey began in May 1958, there was no reason to believe that any of the hospitals had a staphylococcal disease problem in their nurseries.

The city's resident population was 97,999 on July 1, 1958, as estimated by the New York State Department of Health. Its 3 hospitals, which also serve the surrounding suburban and rural areas, have nursery units with a maximum capacity of 12 bassinets in each unit. The nurseries are not overcrowded, and they were inspected and approved during the preceding year as complying with the provisions of the

New York State Sanitary Code. This code establishes standards for physical features and nursing and medical management of nurseries. The three hospitals are identified here as "A," "B," and "C."

### Methods

The public health nurses employed by both official and voluntary agencies were told the purpose of the study at a series of meetings.

No effort was made to select a random sample of infants or to add to the current caseload of the visiting nurses. Infants were already being visited as part of the maternal and child health program. The policy was to visit all infants of primiparae within 1 to 2 weeks after birth. The nurses were asked to take a history and record their observations of the presence or absence of pustules, vesicles, bullae, and other types of skin infections. Information recorded for each infant included the nurse's description of the skin infection and the date of the nurse's visit, in addition to the infant's name, date of birth, and hospital of birth.

An infant was classified as positive on the basis of a history or presence of skin pustules or more severe suppurative disease. Suppuration was felt to be a more specific index of staphylococcal disease than the vesicular bul-

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*Dr. Fleck is an epidemiologist with the New York State Department of Health, Albany, N.Y. In addition, he is acting head of the department of community health, Albany Medical College, Union University, in Albany, where both he and Dr. Bouton are assistant professors of epidemiology.*

lous, erythematous, or papular rashes which are fairly common in the newborn. Suppuration was also more easily identified and described by the mother and the nurse.

A preliminary analysis was made to determine the relationship between the age of the infants at the time of the nurse's visit and the possible dates of onset of staphylococcal disease. Of 344 routine neonatal visits during a 3-month period, 316 visits were made between the 6th and 20th day following birth; 177 of these were made between the 9th and 12th day. It was felt that this timing was optimal, since our previous experience in New York State nursery outbreaks had shown that the onset of pyoderma occurred most commonly before 10 days of age (1). It was recognized that some cases which have longer incubation periods, such as breast abscess or pneumonia, might be missed.

### Outbreak Findings

The attack rates for each hospital for the entire survey period were not significantly different (see table). The salient finding was the detection of a previously unidentified outbreak of staphylococcal disease in a sample of the newborn infants discharged from hospital B. The presence of an epidemic was suspected when 2 infants among 13 born in hospital B during the first week of November were discovered through the survey method to have signs of suppurative disease.

### Neonatal suppurative disease in a sample of discharged hospital-born infants examined by public health nurses, May 1958-February 1959

Hospital of birth	Estimated total births	Number of infants visited	Number ill	Percent of sample ill
A	1,150	157	3	1.9
B	1,530	391	12	3.1
C	800	56	3	5.3
Other <sup>1</sup>		6		
Total	3,480	610	18	2.9

<sup>1</sup> Resident births in hospitals in other cities.

NOTE:  $n=2$ ,  $x^2=1.66$

The suspicion was confirmed when subsequent visits to an enlarged sample of 46 infants born in this hospital discovered 6 infants with signs of suppurative disease. The suspect diagnoses were confirmed by a physician's examination. Phage typing identified the etiological agent isolated from the lesions as type 80/81 staphylococcus. Examination of all 233 infants born in hospital B during the epidemic period revealed a total of 20 cases of suppurative lesions including 1 death, and an attack rate of 8.6 percent. The types of clinical disease discovered are shown below:

Lesion	Number of infants
One or more skin pustules	11
Impetigo	4
Omphalitis	1
Conjunctivitis	1
Abscesses	2
Septicemia	1

The epidemic occurred in a 55-day interval November 1 to December 25, reaching its peak in 30 days and declining in 25 days. One mother developed a breast abscess.

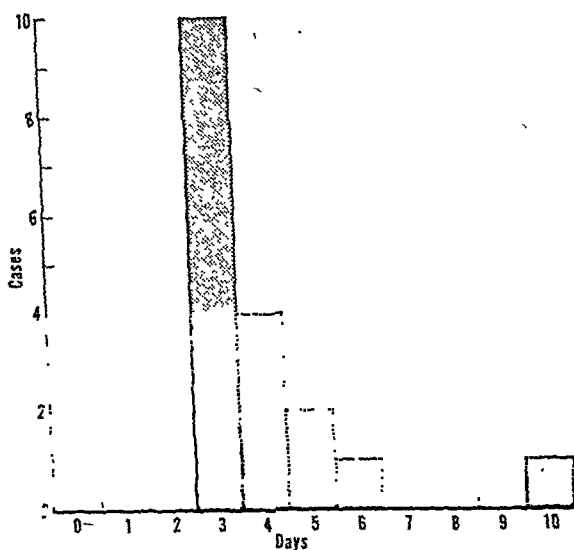
The only death occurred in an infant born November 18 who developed pustules on the buttocks 4 days following birth, an upper respiratory syndrome after 1 month, and died with a type 80/81 staphylococcal septicemia when 8 weeks of age.

Excluding two premature infants with prolonged hospital stays starting before the epidemic period, the range of incubation period, as measured by the interval from the birth-date to the onset date of disease, was 2 to 10 days. The distribution of incubation periods is consistent with a common source outbreak (see chart). The modal incubation period was 3 days.

A bacteriological and phage-typing survey of the nares of personnel and infants ruled out both an infant nasal reservoir of type 80/81 staphylococci and carriers among hospital personnel working in the nursery. Nasal cultures were taken from 30 persons. Six persons were found to be carriers of coagulase positive strains, but none had the epidemic strain.

Two nurseries, equally affected, were on separate air supplies. A common airborne source such as dust or droplet nuclei was believed to

Interval in days from birth date to onset date of staphylococcal disease, hospital B epidemic cases<sup>1</sup>



<sup>1</sup> Data exclude two cases of premature infants born before epidemic period.

be unlikely. One nursery contained only isolette units and the other, conventional single infant bassinets of an approved design. The equipment used in the two nurseries was different and a common fomite source was also considered unlikely.

A source lesion among nursery personnel and a resulting spread of staphylococci by direct contact was suspected. However, physical examination of all personnel in contact with the nursery, conducted by hospital staff physicians, did not reveal any source lesions.

The reasons for the cessation of the detected epidemic were not discovered. Two factors may have been involved: the special attention given to aseptic principles as a result of the concern of the staff about the outbreak, or the spontaneous recovery or departure from the nursery staff of a worker with an unrecognized lesion discharging staphylococci.

#### Other Findings

In addition to the detected epidemic, examinations by visiting nurses provided an estimate of the nonepidemic levels of suppurative disease. Exclusive of the epidemic period in hospital B, 12, or 2.1 percent, of 564 infants visited

after discharge from the three hospitals were found to have evidence of suppurative disease. Of the 12 cases, 9 had only few or solitary skin pustules, 2 were classified as impetigo, and 1 had a purulent conjunctivitis. No bacteriological studies were made on these infants.

The nonepidemic level of infant suppurative disease, 2.1 percent, observed in this survey of primiparous births differs from that reported in the literature. Williams (7) reports endemic levels of 5 to 15 percent based on daily hospital observation of newborn infants for evidence of pustules, conjunctivitis, or other suppurative disease. Ravenholt (8) conducted a telephone survey of a sample of infants born in a hospital. Excluding 1 hospital with an epidemic, he found a pyoderma attack rate of 15.5 percent in a sample of 642 newborn infants discharged from 12 hospitals. Other investigators have found nonepidemic attack rates for infant pyoderma ranging from 5.5 percent to 22.0 percent, with most attack rates falling between 13 and 17 percent (9-14).

#### Aftermath

The survey technique using public health nurses is being followed in 12 counties in New York State, where 2,472 infants have been examined during the period July 1958 to April 1959. Eighty-three infants, or 3.3 percent, were observed to show evidence of suppurative disease.

This lower level of suppurative disease may be attributable to the enforcement of regulation 35 in chapter II of the New York State Sanitary Code, entitled "Precautions To Be Observed for Control of Diarrhea of the Newborn." Annual inspection of nurseries and adequate enforcement have eliminated to a great extent the hazards of overcrowding, neglect of handwashing, and other factors which encourage contact transmission of any communicable disease.

#### Conclusion and Summary

The rationale of the examination of infants after hospital discharge as a means of detecting nursery outbreaks of hospital-acquired staphylococcal disease is based on the assumption that



the incubation period is longer than the hospital stay. This study demonstrated that the technique will be applicable, even when the modal day of onset of disease coincides with the next-to-the-last day of hospital stay. In practice, minor pustular manifestations are not considered as a barrier to scheduled discharge. The removal of the cases from the hospital forestalls the detection of an epidemic unless someone initiates an intrahospital reporting system which can be used to develop data on attack rates of suppurative disease.

Surveillance of infants by public health nurses for evidence of suppurative disease after hospital discharge detected an outbreak of the disease in a hospital in one city. Exclusive of this outbreak, the nonepidemic level of staphylococcal disease in infants measured by the presence of suppuration was 3.3 percent in a group of 2,472 infants visited in 12 counties in New York State, and 2.1 percent in a group of 564 infants visited in 1 city.

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### Epidemiology Course for Nurses

A refresher course in communicable disease control, emphasizing epidemiological and statistical principles and techniques in terms of major communicable diseases, will be held from February 29 through March 18, 1960, at the Communicable Disease Center in Atlanta, Ga.

Communicable disease nursing consultants, public health nursing supervisors, educational directors, qualified public health staff nurses, industrial nurses, instructors in schools of nursing, and other nurses having supervisory, teaching, or consultant functions are eligible for admission.

Application forms and further information can be obtained from the Chief, Nursing Section, Epidemiology Branch, Communicable Disease Center, Public Health Service, 50 Seventh Street N.E., Atlanta 23, Ga., or from the directors of public health nursing of State health departments. Applications should reach the center no later than February 8, 1960.

# Trends in the Care of the Mentally III

ROBERT T. HEWITT, M.D.

**R**ESPONSIBILITY for care and treatment of the mentally ill is moving out from the mental hospital into the community, the outpatient clinic, the general hospital, the physician's office, and the home. There seems to be no immediate danger of the public mental hospital going out of business. However, there are indications of many efforts to find out what is the place of the mental hospital in the changing treatment picture.

As evidence has unfolded to indicate that the traditional mental hospital is not the most appropriate place to treat all mental illness and that the hospital itself may be a factor in the development of chronicity, statements have been made that "The mental hospital must go." More moderate opinion has been concerned with the need of modifying the old but also with developing other and hopefully more effective means of meeting the situation. The experiences of World War II, the advent of the tranquilizing drugs, studies of social scientists in mental hospitals, an aroused public conscience, and increased governmental interest—local, State, and Federal—have all been cited as responsible catalysts in the reaction.

Grants from the National Institute of Mental Health, Public Health Service, known as mental health project grants, are specifically designed to support projects for the development of new and improved methods in the areas we are discussing. These projects are pilot projects, experiments, demonstrations, and studies. The Office of Vocational Rehabilitation is also supporting projects in rehabilitation of mentally ill persons.

Mental illness is often precipitated by a crisis in the family, on the job, or elsewhere. Appropriate treatment given in an appropriate manner and at the appropriate time will often re-

store equilibrium, though not necessarily cure the patient of basic personality problems which make him prone to such crises. However, it may be possible for him to continue at home and at work without interruption or with minimal disruption. Commitment and hospitalization may be unnecessary and may make the total problem worse by disrupting the social and family situation. Like idleness enforced on muscles by immobilization of a limb, hospitalization results in some atrophy or regression with consequent prolonged recovery and more chance of developing chronicity. Of course, the nature of the illness may make hospitalization, even for long periods, the treatment of choice, but it has been shown that frequently it is not necessary. It has also been shown that hospital programs can be planned so that even the long-term patient is helped to reach his maximum level of functioning.

A corollary is that if social and family ties are not to be weakened, the patient should be treated as near home as possible, even if hospitalized. Also, if the patient is to avoid chronicity and relapse, rehabilitation and aftercare are necessary.

## Alternatives to Hospitalization

Many of the new methods being tried out are called alternatives to hospitalization. While they are usually looked upon as substitutes for care in a mental hospital, they are steps toward

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*Dr. Hewitt is psychiatrist, Community Services Branch, National Institute of Mental Health, Public Health Service. This paper was delivered during the meeting of the State and Territorial mental health authorities in Washington, D.C., March 11-13, 1959, and appears in the proceedings of the meeting.*

developing care and treatment methods which are appropriate to the illness and situation of the patient. They also represent an effort to achieve continuity of care throughout the different stages of a patient's illness. They are, for the most part, experimental and the subject of study at the present time. Very possibly in the future they may become essential elements in effective and comprehensive treatment programs. Many hospital administrators and others are convinced that construction of facilities for the care and treatment of the mentally ill must and will be modified in the light of the knowledge developing from current experimentation with these methods.

Some interesting projects are being developed to explore the ways in which early treatment can be provided in the acute phase of an emotional disturbance. Exploratory work is being done on the feasibility of establishing treatment teams available at any time to go out into the community to see patients immediately when a crisis arises which involves an emotional disorder. This is not only for the purpose of treating a patient early in his illness but is also based on the idea that the person did not become ill in a vacuum and it is necessary to see him in his own home or job situation to assess the environmental factors involved. Recommendations may be made or action taken which may involve referral to a nonpsychiatric agency, referral for treatment to a physician, an outpatient service or a hospital, or further diagnostic study by the emergency team.

A variation of this approach being explored is seeing each patient immediately as he comes to the outpatient department or the clinic, along with his family whenever possible. Here also an attempt is made to understand the problem in its psychological and social ramifications and to take action as quickly as possible. This is contrary to a familiar pattern of placing people on a waiting list for later consideration. It is hypothesized that many problems can be solved quickly and more efficaciously if attacked when acute and that a waiting list is not necessary. In many situations long-term psychotherapy is not desirable or required. Family counseling, environmental manipulation, or physical therapy may be the treatment of choice. There is evidence that conventional psychotherapy is not

suitable or effective in some socioeconomic groups.

Basically, day hospitals are outpatient departments, modified to fit the mentally ill patient. Patients are in the hospital for a varying number of hours during the day and then return home. The conventional outpatient treatment of 1 hour a day, successful with many mental patients, is not enough for the psychotic patient or for many neurotic patients. Diagnosis, treatment, and rehabilitation are functions of the day hospital. Various kinds of therapeutic activities may be added. These hospitals are usually open 5 days a week. Some patients may have daily appointments and some may come only when they feel the need. Day hospitals for children may be organized as schools with treatment of emotional disorders added. Others are organized as child guidance clinics with the school added.

Night hospitals are operated for patients who work during the day. They spend the evening and night at the hospital.

Many types of programs make use of the "halfway house." It is intended to be a transitional domicile for patients who do not require further hospitalization but are not yet ready to resume independent living. They live with other patients under some supervision in this transitional dwelling, moving gradually back into the community by reestablishing relationships through employment, social and family activities, and recreation.

This is a broad description of halfway houses. In practice they vary a great deal in organization, program, and auspices. For example, one halfway house is established specifically for the purpose of finding work for patients. Another provides not only supervision and social activities but also psychiatric treatment. Halfway houses in the community may be organized under official or voluntary auspices. Some are developed under the supervision of the mental hospital and may even be located in a ward of a mental hospital. In such cases the hospital regulations are liberalized with regard to this ward. Patients are placed more on their own responsibility with regard to movement in and out of the hospital and their activities within the hospital. Definite rehabilitation programs are organized for

them and they are encouraged to step out into the community.

Social clubs for ex-patients may be organized and supervised by professional people or they may be organized by ex-patients themselves. They attempt to provide some social life for ex-patients and in many instances offer counsel and advice as to sources of help: social, medical, and vocational. Some halfway houses are not residential facilities but in actuality are social clubs.

Followup and aftercare services for mentally ill patients discharged from hospitals are being extended. We need studies to help in planning the type of these services to develop. For example, how many and what kinds of patients want or need these services? What services may best be offered by the hospital or by the clinic? What should be provided by the official and voluntary health and welfare agencies in the community? It is generally agreed that a coordinated effort is a prime necessity. The public health nurse, the social worker, the vocational rehabilitation worker, the practitioner of medicine, and many others have a role to play just as they do in other human problems.

### **General Hospitals and Community Centers**

Twenty years ago there were 48 general hospitals in the United States treating psychiatric patients. Now there are 500 to 600 with psychiatric units. Many others accept mentally ill persons for short-term treatment. This has been both a cause and a result of more psychiatrists moving into practice in communities. Factors in this trend have been the improvement in treatment techniques, the increased experience and confidence of psychiatrists that patients can be treated in general hospitals, and the increased understanding and leadership of hospital administrators. The length of hospitalization is usually short and no commitment is involved, so that there is less social disruption for patients and their families. Patients are often more amenable to the idea of going to a general hospital than to a mental hospital, and their attitude is frequently more favorable for treatment. Several States are experimenting with subsidizing the care and treatment of patients in the psy-

chiatric wards of general hospitals. These wards are for patients who would ordinarily be admitted to State mental hospitals. In other places attempts are being made to admit all mentally ill persons from a specific area to a psychiatric service to determine the feasibility of such care for all mentally ill.

Many psychiatric services are so large that they really operate as mental hospitals under the administrative umbrella of a general hospital. In other general hospitals, psychiatric patients are hospitalized with general medical patients and there are no separate wards. Without discussing in detail the advantages and disadvantages of treating patients in general hospitals, we already have abundant evidence that we should continue to move ahead in developing psychiatric services in these hospitals. We need to study the possibility of integrating care and treatment of the physically and mentally ill just as we need to appreciate that there are unique aspects to each.

Community mental health centers are conceived of as places where all mental health services, including prevention, promotion of mental health, consultative services, treatment, and aftercare services can be centralized. Treatment services may include all of those already mentioned. Experimentation with these centers has occurred mostly in urban areas. It is hoped that they will provide for the coordination of mental health services so difficult to achieve.

### **Mental Hospitals**

Today there is generally a more hopeful atmosphere in mental hospitals. Although admissions are increasing, the total number of patients in our State mental hospitals has been decreasing slowly in the last few years. We do not know the meaning of these decreases as both discharges and deaths have increased. There is increased emphasis on treatment and rehabilitation which was additionally stimulated by the advent of the tranquilizing drugs. Studies of social scientists have pointed out that the hospital organization and procedures may promote chronicity. This has resulted in renewed efforts to discharge patients as soon as possible and to design rehabilitation programs for the patients who remain longer.

A recognized first step in producing a therapeutic community is to be sure that you aren't doing anything antitherapeutic. Most authorities, here and abroad, feel that the large mental hospital can be just that. We can't tear down these hospitals tomorrow, but we don't have to make the same mistakes in building new hospitals. Also, we can make important modifications in existing hospitals. Modern treatment ideas call for dividing hospitals into small treatment units so that the personnel and the patients can develop a close relationship and understanding. These units are being established in many older hospitals. This trend must be taken into consideration in planning new construction.

The increased emphasis on the therapeutic use of personnel and other treatment innovations, including the tranquilizing drugs, have made a great difference in the care of the so-called disturbed patients. Episodes of disturbed behavior occur but are treated more effectively. The old "disturbed" ward is almost gone. In hospitals of the future, security will be a minor issue as compared to what it has been in the past.

This brings us to a discussion of the open hospital. The idea of a completely open hospital began abroad and has many supporters in this country. Even though the open hospital movement has proceeded more slowly in this country than in the United Kingdom, the philosophy that patients are able to respond positively to more freedom has resulted in the unlocking of more wards throughout the country. Protagonists of the open hospital idea say that it reduces administrative problems and improves the attitudes of patients and personnel. They maintain that it is unnatural to lock patients up; that locked doors are a cause of a good deal of disturbance and chronicity in mental patients. It is evident that allowing patients more freedom makes it imperative to provide activities for them. It stimulates a reorientation of attitudes on the part of personnel and also has implications for hospital construction.

Planning of facilities must be preceded by good program planning if we are to avoid having programs determined by the kind of facilities available. The isolation of mental hospitals from physical care facilities, training

sources, and community health and welfare agencies, both physically and psychologically, has impeded the development of mental health programs. This calls for mutual study and planning.

### The Aged

All States are grappling with the problem of the aged mentally ill. It is alleged that there are many aged patients in mental hospitals who really should be in their own homes, in nursing homes, or homes for the aged. This is one of our unsolved problems and we need more facts to deal with it. Just how many aged patients in mental hospitals could be cared for adequately in homes for the aged?

People who have been working with the aged believe that here, more than in any other age group, coordinated planning by those responsible for physical and mental health and welfare is necessary. The idea that aged patients once admitted to a mental hospital must die there has been discredited. Many older patients have transient psychoses, such as depression, which yield to treatment, both physical and psychological. Many of them require brief periods of hospitalization and then can go back to their own homes, or to nursing homes. Much more study and collaboration are needed in planning programs for the aged.

### In Conclusion

What are some of the factors which we need to think about in planning for the future? The care of the mentally ill has been traditionally State supported and provided on a mass basis in large mental hospitals. But will this be the pattern for the future? I have indicated that there are alternatives to sending all mentally ill patients to mental hospitals and that short-time treatment in general hospitals is feasible for many patients. Vocational rehabilitation has made forward strides in the rehabilitation of the mentally ill in the last few years. In many places health insurance programs have extended coverage to some area of mental illness and studies are being initiated at the present time to investigate the cost of further coverage. Some union medical care plans are underwrit-

ing both treatment in general hospitals and outpatient treatment. Resources from social security benefits are available to an increasing number of persons. Patients and their families will be more able to carry the cost of short-term care if they are helped by insurance and if

treatment facilities are conveniently available to them. All of these factors must be taken into consideration in thinking about our total problem. They make clear the need for coordination in planning mental health facilities for the mentally ill.

## Legal note . . . Sanitation

Sanitary district liable for property damage when clogged manhole caused sewage to back up and overflow into home. Duty of proper inspection of sewer lines. *Mulloy v. Sharp Park Sanitary District* (164 Cal. App. 2d 391, 330 P. 2d 441, October 1958).

Plaintiff brought an action for damages against the defendant sanitary district, alleging that the district created a private nuisance and was guilty of negligence in allowing a manhole of the sewer system operated by it to become clogged, causing the plaintiff's home to become flooded with sewage and debris. On appeal by the sanitary district, a jury verdict in favor of the plaintiff was upheld by the California District Court of Appeal.

The facts, as stated by the court, were that the district operated a sewer system consisting of a sewage collection system and a treatment plant. The system had about 500 manholes, and 1 manhole was located directly in front of the plaintiff's home, which was connected to the sewerlines.

On the day in question, when plaintiff flushed a toilet, water backed up in the toilet and bathtub, flooding the bathroom and other rooms in the house with about 4 inches of sewer water and debris, causing extensive damage.

When the defendant's employees were called, they found the manhole plugged and full of water. They dislodged a broom or mop from the sewer pipe connected to the manhole and there was evidence that there was other debris in the manhole.

The defendant's evidence indicated that all the manholes were routinely inspected about every 30 days. The manhole in question had been inspected the day before the occurrence complained of and no obstruction of the sewer was seen at that time. The inspectors, however, had not descended into the manhole but had merely lifted the cover and looked down, a process which took about 1 minute.

The defendant's superintendent also testified that it was good practice to conduct occasional flushings and cleansings of sewerlines, but the defendant did so only when the lines were obstructed. The line serving the plaintiff's home had not been flushed prior to the flooding.

The district contended that, as a public agency engaged in a governmental activity, it could not be held liable in the absence of a special statute. The court rejected this contention, holding that in California a governmental unit is liable for creating and maintaining a condition declared to be a nuisance by the legislature. Under the statutory definition of nuisance contained in section 3479 of the California Civil Code, as "Anything which is injurious to health, or is indecent or offensive to the senses, or an obstruction to the free use of property, so as to interfere with the comfortable enjoyment of life or property . . .," the court held that the facts in the case unquestionably constituted a nuisance.

Disposing of the district's argument that it could not be held liable for negligence, the court held that under the decided California cases a governmental agency was liable for negligent damage to real property. The limited inspection of the manhole, the court declared, supported an inference of improper inspection of the sewer system and upheld the finding of the jury that the district was guilty of negligence.

—SIDNEY EDELMAN, assistant chief, Public Health Division, Office of General Counsel, Department of Health, Education, and Welfare.

# Occupational Health Notes

## *Sporotrichosis Among Miners*

Mature spores of the fungus *Sporotrichum schenckii* in mine timbers afflicted more than 3,000 miners with skin lesions and internal damage before the source was detected and controlled, reports Dr. Rebecca Brown, Transvaal Chamber of Mines, Timber Research Laboratory, Johannesburg. She was in Montreal at the Ninth International Botanical Congress.

## *Castor Bean Pomace*

Castor bean pomace, imported from South America for use in fertilizer, has caused outbreaks of illness in workers handling the material at eastern seaports. The pomace, which is the residue after oil is extracted from the castor bean, has long been recognized as capable of producing illness since it contains a powerful toxin, ricin, and a potent allergen.

An outbreak in Baltimore in February 1959 affected 18 of 45 railroad workers. Symptoms were upper respiratory distress, asthma, nausea, vomiting, chills, and fever. The Public Health Service found that similar incidents had occurred in Norfolk, Va., Wilmington, Del., and Tampa, Fla.

Recommendations to importers included steam treating, improved packaging and handling, and the use, where necessary, of protective clothing, eye protectors, and respirators.

## *Insecticide Hazards*

Two young market garden workers in Massachusetts died as the result of insecticide poisoning. Over several days they had spent about 12 hours applying various kinds of insecticides including parathion. On the day they died, they worked the entire day dusting turnips with a powder containing 1.5 percent parathion. They used knapsack dusters. They became ill about 5 p.m., and 2 hours later were taken to the local hospital where atropine therapy was administered. Autopsies were not per-

formed, but the symptoms of the men were typical of organic phosphate poisoning.

The workers reportedly had been informed of the hazardous nature of the insecticide but were not required to wear respirators and protective clothing, although the equipment was available. The bags of insecticide carried warnings of toxicity but were not labeled "poison" and had no statement as to antidote or treatment.

## *Explosion in a Plastics Plant*

Lack of proper identification on containers was the basic cause of an accident which took one life and extensively damaged a plastics plant compounding polyester resins.

Assigned to clean up the crib where materials were mixed, an inexperienced employee of the Michigan plant tried to consolidate two half-filled gallon jugs which he believed contained the same material. One jug contained DDM (methyl ethyl ketone peroxide in dimethyl phthalate); the other, cobalt naphthenate. An explosion and fire resulted.

The worker received burns over 95 percent of his body and died about a week later. Plant damage from fire was at least \$100,000.

## *State Radiation Regulations*

The Kentucky State Board of Health has adopted comprehensive radiological health regulations, and the Tennessee State Industrial Hygiene Service last summer began registration of radiation sources, in accordance with the Radiological Health Service Act.

## *Compensation for Radiation Exposures*

Ionizing radiation exposure may result in physical injury, wage loss, and possible limitation of the employee's capacity to continue to work. All these effects, weighed for workmen's compensation, may not be evident for years after the guilty exposure. Donald Ream, consultant to the U.S. Bureau of Labor Standards, stressed particularly the time factor at the First Annual Governor's Conference on Workmen's Compensation in New Jersey, saying that a rating should permit continuing evaluation. He told of 35 workers reported by the U.S. Atomic Energy Commission as having received the "maximum" radiation dose but who might not evince outward symptoms for years.

*Despite unchanged attitudes, the majority of the recalcitrant tuberculous patients discharged from the California Medical Facility during a 6-year period generally remained under medical supervision, and the disease of more than half of them became inactive or probably inactive.*

## Followup of Tuberculous Recalcitrants

EDWARD KUPKA, M.D., and DOROTHY L. GIBSON, P.H.N.

PRIOR to 1949 local health departments in California, except in Los Angeles County (1), frequently had difficulty in enforcing the isolation of infectious tuberculous patients who refused to cooperate. It was usually difficult to make sure that home isolation was being maintained; few county hospitals had facilities for escapeproof custody; and local jails generally were unsuitable for the detention of a person with infectious tuberculosis. Although the uncooperative tuberculous were a very small proportion of the total number of known patients, each was an unquestioned hazard to community and family and absorbed a disproportionate amount of the time and effort of health department workers.

Enactment of specific laws dealing with tuberculosis by the California Legislature in 1949 encouraged new approaches to the difficulties. These laws designated the disease as a public health menace; defined in detail the responsibilities of the health officer and other law enforcement officials in tuberculosis control; and specified the powers and duties of the health officer in enforcing isolation of infectious cases (2).

The legislation empowered the California State Department of Public Health to establish a hospital unit for recalcitrant patients to which violators of isolation could be sent by

the courts. The law also protected tuberculosis patients against indiscriminate incarceration by stipulating that the health officer must be ready to present evidence at court to verify the hazard of the individual's disease to the community.

With the cooperation of the California State Department of Corrections, a 20-bed unit with both hospital and prison characteristics was established in 1950 for male tuberculous recalcitrants. First located in temporary quarters at Terminal Island near Los Angeles, the unit was moved in 1954 to the newly constructed California Medical Facility near Vacaville in northern California. Meanwhile, as use of the facility increased, the number of beds available was increased to 50, with an average occupancy of 40.

The California Medical Facility was established to care for male felons from the State prisons who require special treatment for physical or psychological illnesses, including tuberculosis (3). The tuberculous felons and recalcitrant tuberculous patients sentenced by the courts for the specific misdemeanor of violation of isolation are cared for in the same section of the hospital. Medical and nursing services are provided by the institution staff. Individual and group psychotherapy, as well as occupational and recreational therapy, are available on a voluntary basis when permitted by the clinical status of the patient.

Although the local health officers now have a legal weapon of great utility, the law has been used conservatively. Annually, only about 1 in

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*Dr. Kupka is chief, and Mrs. Gibson, the nursing consultant of the bureau of tuberculosis control, California State Department of Public Health, Berkeley.*



500 patients under health department supervision has been sentenced to the facility. Education and persuasion are tried repeatedly before the health officer turns to legal procedures. Court action is almost always against an offender who has repeatedly disregarded the most elementary protective practices and violated isolation orders. Local judges have seldom failed to act upon the health department's complaint in such a situation. If the trial does not result in incarceration, the court at least puts the offender on probation, on condition that he return to the sanatorium and remain there until dismissed medically.

The California State Department of Public Health screens admissions to the medical facility, assists in establishing general treatment policies of the tuberculosis section, and sometimes participates in the legal processes. At first the screening was necessary to keep the number admitted within the unit's capacity, but it also has enabled the department to request reconsideration of an occasional commitment when the evidence of contagiousness was out of date or not convincing. In earlier years it gave the department an opportunity to discuss the legal action with the local judge, sometimes voiding an improper commitment.

Between December 1950 and December 31, 1956, 211 recalcitrant tuberculous patients were admitted to the California Medical Facility. What happened to these men? How many have been lost to observation? How many are still alive? Over several years, has the disease of most of them improved? Are they currently under supervision or care? Have their attitudes changed?

Since the State bureau of tuberculosis control keeps only an admission and discharge file, limited to basic identifying, medical, and legal data, followup information was obtained from questionnaires sent to the 37 local health jurisdictions from which one or more persons had been sent to the facility for recalcitrants. Name, age at admission, facility file number, dates of admission and discharge, and length of sentence of each of the patients were abstracted from the basic file and typed on a questionnaire before it was sent to the appropriate health department. The local health departments were asked to add from their records of the patients

the last-known status of disease, interval since last examination, type of present medical supervision, admissions to other tuberculosis hospitals since discharge from the facility, marital status at time of first admission, and attitude since discharge.

Twenty-eight of the 211 patients were in the California Medical Facility on December 31, 1956, and were not included in the study. A total of 183 questionnaires were sent, and all but 2 were completed and returned. This excellent response may be interpreted as reflecting the strong interest of the local health departments in the legal detention program.

The responses indicated that 22 of the 181 were known to be dead; 6 died while in the facility; 16, after discharge. The remaining 159 patients constitute the group analyzed in tables 1-4.

About three-quarters (131) of the patients were in the age group 25-50 years. In this sample few young adults and oldsters were recalcitrants. The age of patients at first admission to the facility was as follows:

<i>Age group (years)</i>	<i>Number</i>
Under 20.....	4
20-24.....	6
25-29.....	26
30-34.....	27
35-39.....	21
40-44.....	25
45-49.....	32
50-54.....	15
55-59.....	10
60-64.....	5
65 and over.....	8
Not stated.....	2
Total.....	181

Negroes and Mexican-Americans each comprised 13 percent of the group; there were no Chinese or Japanese.

<i>Ethnic group</i>	<i>Number</i>	<i>Percent</i>
White.....	125	70
Negro.....	25	13
Mexican-American.....	24	13
Indian.....	3	4
Filipino.....	1	
Not stated.....	3	
Total.....	181	100

The marital status of the group at time of admission was in marked contrast to that of the male adult population in general. At the time of first admission, only 42, or 23.2 percent, were married and 89, or 49.2 percent, were single, separated, or divorced. The status of 50, or 27.6 percent, was not known or not stated.

As expected, the most populous jurisdictions in the State sent the most patients to the facility. However, 37 of the 47 full-time health jurisdictions in California have sent a patient to the facility on at least one occasion. Such wide acceptance reflects the need for this kind of institutionalization and also the willingness of the local health officers to utilize this legal resource after other means of achieving control of the infectious person have proved futile. Since Los Angeles County operates an excellent comparable sheriff's facility at Mira Loma, the health departments in that county have usually sent only recidivists or individuals with significant prison records to the State facility.

The following observations concern only the 159 patients who were known or presumed to be living at the time the data were gathered.

Table 1 indicates the strong possibility of satisfactory outcome of the disease even in tuberculous patients of the type covered by this report; the disease status of 91, or 57 percent, was known to be inactive or probably inactive.

After discharge from the facility, some of the

individuals were lost to observation. Since the status of 13 of the active and probably active group had not been checked for a year or more and 11 had dropped out of sight so that no data were available, it is clear, but not surprising, that the patients in the group continue to present caseholding problems (table 1).

**Table 2. Attitude after discharge of recalcitrant tuberculous patients, California, 1950-56**

Patient's attitude	Last-known status of disease					
	Total	Active	Probably active	In-active	Probably in-active	No data
Total.....	159	53	4	85	6	11
Improved.....	38	12	1	23	1	1
Unimproved:						
Same.....	85	37	2	41	3	2
Worse.....	2	1	0	1	0	0
Unknown.....	34	3	1	20	2	8

Attitudes of the patients toward their disease, judged in the broadest terms and, of course, highly subjectively, are shown in table 2. When these data are compared with those in table 1, it is evident that improvement in the status of the patient's disease had occurred in many cases without a corresponding change in the patient's attitude. Thus, although 72 percent of the patients had been examined within 12 months (table 3), only 24 percent were reported as having an improved attitude toward the care of their disease.

The majority of the surviving group were not living with family, and many of them continued to lead a nomadic existence. From information volunteered on the questionnaires, it was evident that many of them were alcoholics. In members of such a group a change in attitude in the direction of cooperation with a public agency is perhaps not to be expected. Nevertheless, for these patients legal isolation accomplished at least two important and previously unattainable objectives. First, it reduced the length of time the patients could spread tuberculosis to others, and second, the medical and surgical therapy given the patients led to eventual arrestment of disease in a considerable number.

**Table 1. Last-known status of disease of recalcitrant tuberculous patients,<sup>1</sup> California, 1950-56**

Last-known status of disease	Length of time prior to Dec. 31, 1956, that status was known.			
	Total	0-6 mos	6-12 mos.	More than 12 mos.
Total.....	159	94	25	40
Active.....	53	33	8	12
Probably active.....	4	3	0	1
Inactive.....	85	48	16	21
Probably inactive.....	6	4	1	1
No data.....	11	6	0	5

<sup>1</sup> Known or assumed to be living on Dec. 31, 1956.

**Table 3. Length of time since last examination of recalcitrant tuberculous patients, California, 1950-56**

Last known status of disease	Total	0-6 mos.	6-12 mos.	More than 12 mos.	Time not stated
Total:					
Number-----	159	99	15	31	14
Percent-----	100	63	9	19	9
Active-----	53	33	5	9	6
Probably active-----	4	3	0	1	0
Inactive-----	85	55	10	16	4
Probably inactive-----	6	4	0	1	1
Activity undetermined or not stated-----	11	4	0	4	3

Patients discharged from the recalcitrant unit are routinely transported to their own health jurisdictions by the sheriff's department of that county. The discharge occurs on the last day of the sentence, that is, 6 or 12 months after admission, depending on whether the patient is serving a first or subsequent sentence. If further treatment is needed, and it often is, the patients are immediately admitted to a tuberculosis hospital, usually the one operated by the home county.

Table 4 shows 245 later admissions to any tuberculosis institution for the group. Ex-

**Table 4. Admissions<sup>1</sup> to tuberculosis hospitals after discharge from California Medical Facility among 159 recalcitrant tuberculous patients, California, 1950-56**

Type of hospital	Number of admissions	Subsequent departures AMA <sup>2</sup> or AWOL	
		Number	Percent
Total admissions--	245	92	38
County tuberculosis facilities--	164	64	39
VA tuberculosis hospitals--	39	23	59
Private hospitals--	11	5	45
State mental institutions--	8	0	-----
California Medical Facility (resentenced)-----	23	0	-----

<sup>1</sup> Includes readmissions.

<sup>2</sup> Against medical advice

cluding 23 readmissions to the recalcitrant facility, which is escapeproof, the remaining 222 admissions eventuated in 92, or 41 percent, subsequent unauthorized departures, a further verification of the failure to change attitudes. Of the 23 readmissions to the California Medical Facility, 4 were accounted for by 2 patients, who each had been sentenced to 3 separate terms in the prison ward.

This is to be considered as a progress report and from it no solid evaluation of the impact of this type of program upon the control of tuberculosis can be made. It would be useful to compare a group of recalcitrants who were not incarcerated and to note any differences in the behavior of their disease. Even more valuable would be a comparison between the number of new secondary cases attributable to contact with members of a nonincarcerated group and the secondary cases attributable to a group such as the one described in this paper. However, the excessive mobility, evasiveness, and social instability of the patients make such long-term studies extremely difficult.

### Summary

Sentencing recalcitrant tuberculous patients to a special State facility by court action has proved practicable and useful in California. Use of this legal procedure not only has decreased the hazard of transmission of disease but also has created an opportunity for the commencement or continuation of much needed treatment for the patients.

Although the attitude of the majority of patients did not improve as a result of their incarceration, most of them remained under some type of medical supervision following discharge, and three-quarters had been examined during the 12 months preceding receipt of the questionnaire sent to the local health departments. However, many evaded regular medical supervision, especially after 1 year; one out of eight patients had to be readmitted to the State facility; and a third of those subsequently admitted to local tuberculosis hospitals again resorted to unapproved self-discharge. Nevertheless, the data indicate that by the time of the study more than half of the patients had

reached the classification of inactive or probably inactive.

The majority of health jurisdictions in the State have sent at least 1 patient to the facility, which would indicate that it is meeting a real need, but the small total (211 in 6 years) indicates that it is not being used indiscriminately or excessively.

## films

### Recognition of Leprosy

16-mm. motion picture, color, sound, 13 minutes, 1959, not cleared for television. (Order No. M-374.)

Audience: Practicing physicians and medical students.

The clinical manifestations of leprosy are depicted as they appear in patients of the Public Health Service Hospital at Carville, La. Techniques of taking and staining skin scrapings to demonstrate the etiological agent, *Mycobacterium leprae*, and of taking skin biopsies to demonstrate pathology of peripheral nerves are shown. Diagnostic procedures are included.



The film is not for sale. It is available on short-term loan (United States only) from the Communicable Disease Center, Public Health Service, Post Office Box 185, Chamblee, Ga.

### Staphylococcal Disease: Manifestations, Prevention, and Control

35-mm. filmstrip, color, silent, 36 frames, cleared for television, 1959 (Order No. F-343).

Audience: Doctors, nurses, hospital personnel.



Various clinical manifestations of hospital-acquired staphylococcal disease, how it is spread, and some of the techniques and methods useful in the control of infections are depicted in stylized drawings.

Included with each filmstrip is a "kit" which contains an instructor's guide, bibliographies, hospital checklist, suggestions and a sample form for telephone surveys, and pertinent reprints. The requestor may keep the kit, whether the filmstrip is borrowed or purchased.

For short-term loan, in the United States only, the filmstrip is available from the Communicable Disease Center, Public Health Service, Post Office Box 185, Chamblee, Ga.

It can be purchased at approximately \$5.10 f.o.b. New York (10

## REFERENCES

- (1) Telford, P. K., and Bogen, E.: Compulsory isolation for tuberculosis. *Am. Rev. Tuberc.* 45: 288-291 (1942).
- (2) Kupka, E., and King, M. R.: Enforced legal isolation of tuberculous patients. *Pub. Health Rep.* 69: 351-359, April 1954.
- (3) McGee, R. A.: California builds a new prison system. *State Government* 25: 143-146, July 1952.

percent discount for nonprofit organizations) from United World Films, Inc., 1445 Park Ave., New York 29, N.Y.

### Aseptic Technique—Handwashing

16-mm. motion picture, color, sound, 3 1/2 minutes, cleared for television, 1959 (Order No. M-375).

Audience: Nurses, student nurses, medical students, physicians.

This film shows a method of handwashing, using cake or liquid soap, that may be used in the hospital and modified for use in the public health field.

It is available, in the United States only, on short-term loan from the Communicable Disease Center, Public Health Service, Post Office Box 185, Chamblee, Ga.

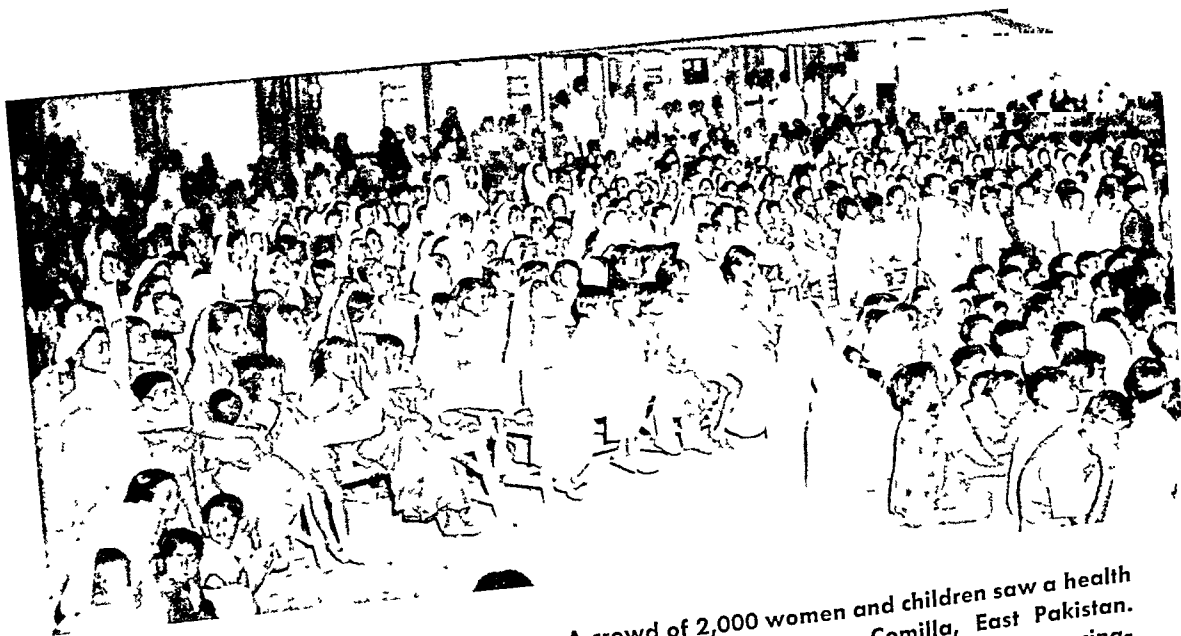
Prints can be purchased, at approximately \$28 f.o.b. New York (10 percent discount for nonprofit organizations), from United World Films, Inc., 1445 Park Ave., New York 29, N.Y.



# *Epidemic Crisis* in East Pakistan

April-July, 1958

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A crowd of 2,000 women and children saw a health show in a village near Comilla, East Pakistan. Health shows were used to further a mass vaccination campaign during the 1958 smallpox epidemic. About 30 million Pakistanis were inoculated.

**E**PIDEMICS of smallpox and cholera began in October 1957 in the Eastern Province of Pakistan, and by April 1958 about 1,500 people were dying each week. The Province's public health services, desperately short of money, staff, and equipment, were hard pressed. In the first 6 months of 1958, the smallpox cases reported were 44,736 and deaths, 20,444. The cholera cases reported were 10,438 and deaths, 6,684.

On April 9 the Chief Minister delegated responsibility for all matters pertaining to the epidemic to a citizens committee of 60 persons, while everywhere volunteers began a vast, spontaneous, uncoordinated vaccination effort. Twenty-one nations, the World Health Organization, and several voluntary agencies sent East Pakistan a total of 8,243,000 cc. of dry vaccine and 18,284,025 cc. of lymph vaccine for smallpox, and 2,475,600 cc. of vaccine for cholera. Five international teams came to give epidemiological assistance.

Ten days after an appeal for help, the first shipment of smallpox vaccine arrived from the United States. By the middle of May, 40 percent of the 46 million population of East Pakistan had been vaccinated, which meant a vaccination rate of more than 1 million per week, and the supply of vaccine was satisfactory. In June, 2 million people a week were inoculated; the number of new cases dropped to 300 a week from a peak of 3,000 a week in May; and a practical means of eliminating the disease in East Pakistan was being developed. Late in June the monsoon began. By July cholera had disappeared, smallpox became less severe, vaccinating had almost ceased (figs. 1 and 2), and by the end of the month the international teams had left the Province.

About 30 million people were vaccinated in the first 6 months of 1958, a substantial achievement in any country, but under the conditions prevailing in East Pakistan, it was remarkable.

### The Setting

The 46 million people of East Pakistan live on the delta of the Ganges and Brahmaputra Rivers. Most of them are Moslems, and many of the women are still kept in purdah.

The Province is almost entirely agricultural. Dacca, the capital, with 600,000 people, and Chittagong, with 300,000, are the only sizable cities. The land consists of silt deposited by the rivers, and when the monsoon breaks in June much of the land, only a few feet above river level in the dry season, disappears under water. The Province is crisscrossed by waterways, varying from a few yards to more than a mile in width, and outside the towns and villages, boats are the easiest and most common means of travel.

Since there are no stones in the alluvial soil, buildings and roads are made of bricks. Every village, hamlet, or row of houses has one or more water tanks, formed where clay has been removed to make bricks or to raise the land to a level above the flood waters. These water tanks are the center of village life, where people come to bathe, wash clothes, urinate, defecate, and collect water for cooking and drinking.

### Public Health Service

East Pakistan had departments of medical care, public health engineering, and public health which were responsible to the Minister of Health through the Secretary.

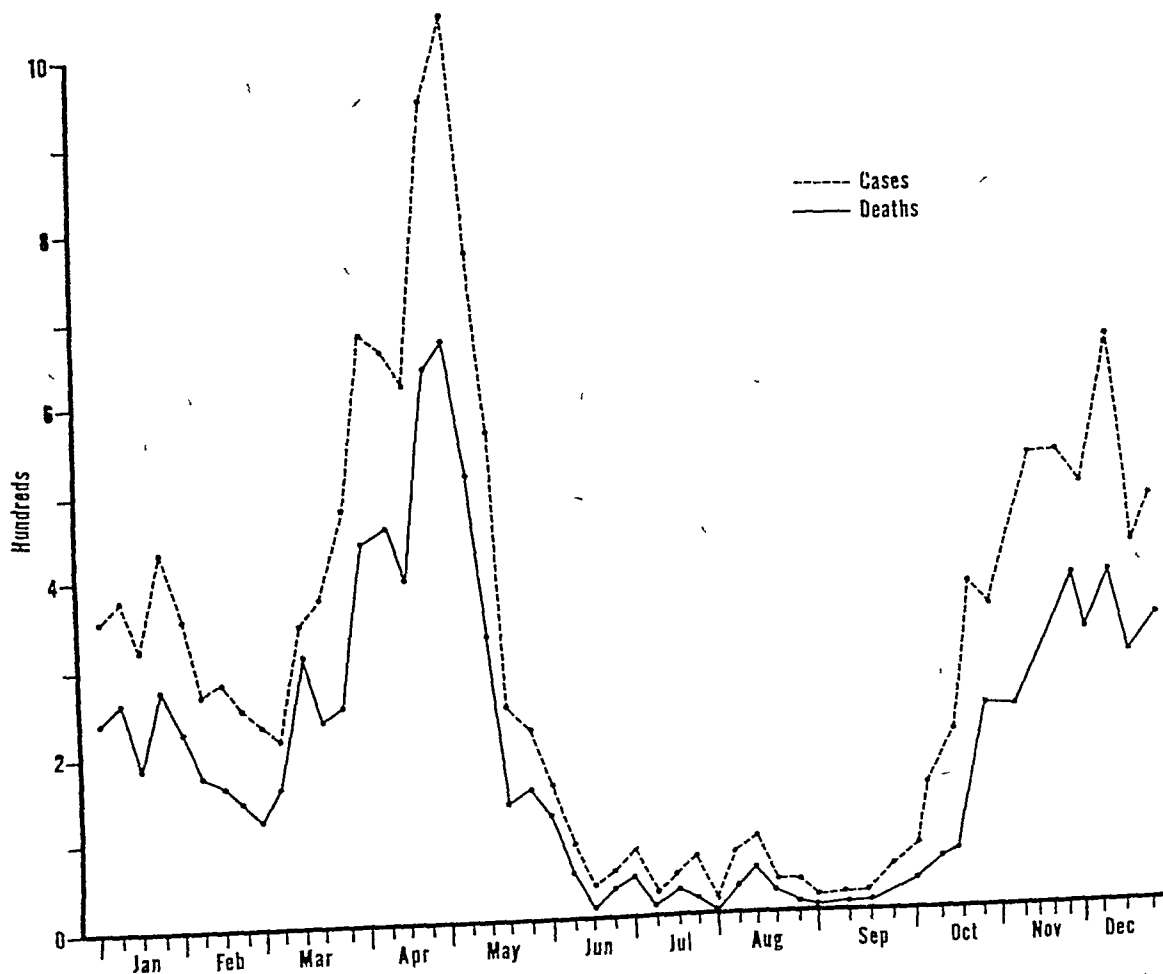
The Department of Public Health which faced the smallpox and cholera epidemics was small. It consisted of a director, 4 assistant directors, 5 district health officers, 12 doctors working on a BCG program financed by UNICEF, 3 doctors helping a village aid project, a small malaria unit, and vaccine laboratories. The department's budget in 1958 was 5 million rupees (\$1 million).

The administration of public health was decentralized so that local authorities based in the Province's 17 districts and in the municipalities employed their own staffs with financial assistance from the department. Only 5 dis-

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Figure 1. Cholera cases and deaths, East Pakistan, 1958



trict health officers were directly responsible to the director of public health; the other 12 were controlled indirectly through financial assistance.

Each district of 800,000 to 5 million people is divided into 1 to 5 subdivisions, which are in turn divided into police areas, or thanas, governed by union boards. The boards pay chowkidars, the village police, who also report births, deaths, and notifiable diseases when they visit the police stations twice a week.

The thanas also have trained sanitary inspectors who train their own small staffs of health assistants and vaccinators. They are responsible to the district health officer, and, in theory, carry out all health duties. East Pakistan has about 400 sanitary inspectors, 1 per 100,000 population. Few diagnoses of infec-

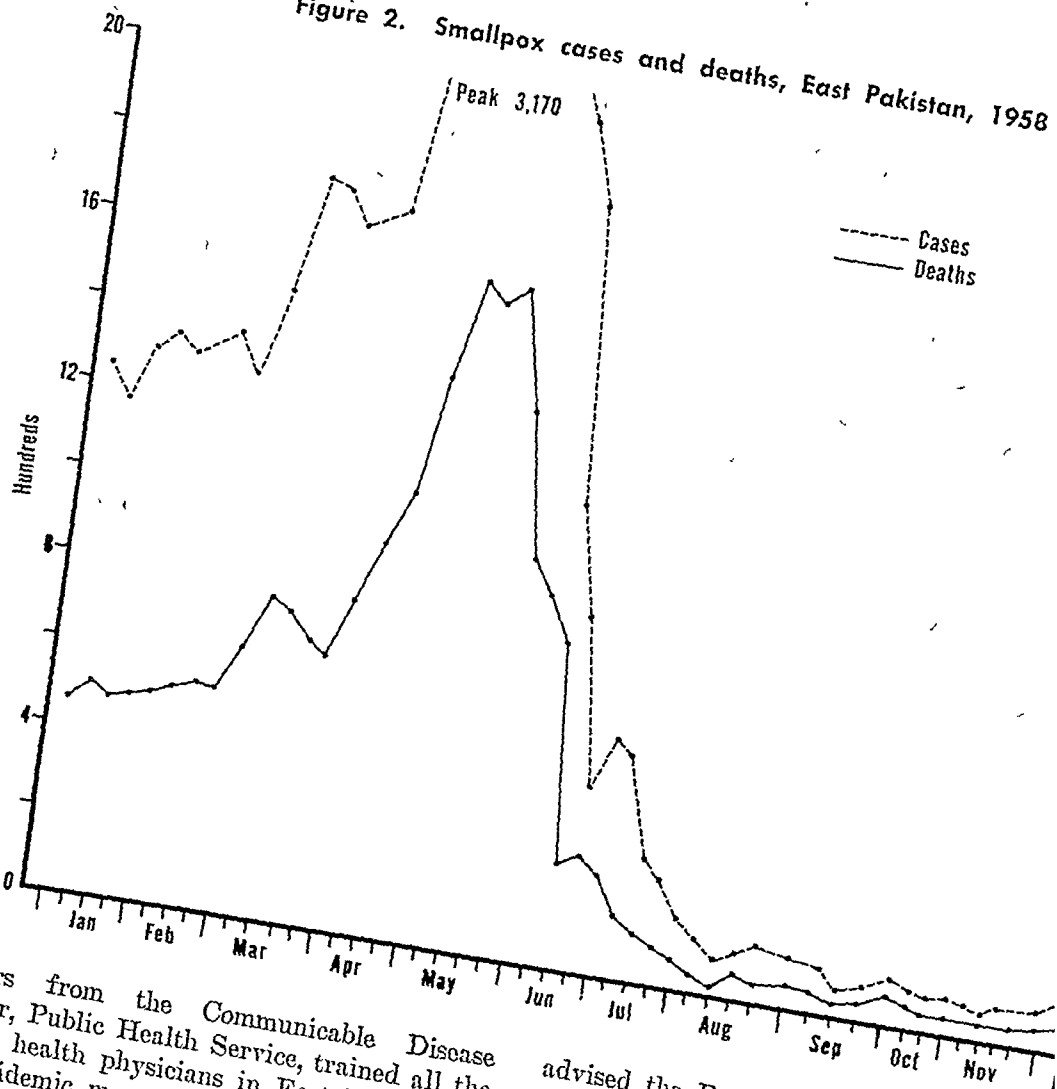
tious diseases or causes of death are made by qualified medical practitioners.

#### International Teams

The International Cooperation Administration and U.S. Information Service teams already in Pakistan dropped other duties to combat the epidemics. The ICA teams, six men from U.S. Operations Mission, West Pakistan, and six from U.S. Operations Mission, East Pakistan, concentrated on organizing and operating antiepidemic activities. The five-member USIS team took over health information tasks with the collaboration of the ICA health educator.

The international teams sent to the Province performed a variety of jobs. The nine

Figure 2. Smallpox cases and deaths, East Pakistan, 1958



officers from the Communicable Disease Center, Public Health Service, trained all the public health physicians in East Pakistan in antiepidemic measures, tested the potency of vaccines, investigated outbreaks of cholera, did epidemic surveillance early in the vaccination campaigns, and later evaluated the success of the vaccinating.

The nine-man U.S. Navy medical research team from Formosa set up a laboratory in the Institute of Public Health for the diagnosis of cholera and conducted bacteriological surveys in affected villages. They also evaluated the potency of the vaccines being received and worked on the production of smallpox vaccine in eggs, the production of dry vaccine, and improved methods of vaccine production from cows.

The six members of the team from the U.S.S.R. collaborated in the studies of cholera,

advised the Department of Public Health smallpox, and were interested in testing value of bacteriophage in the treatment prevention of cholera.

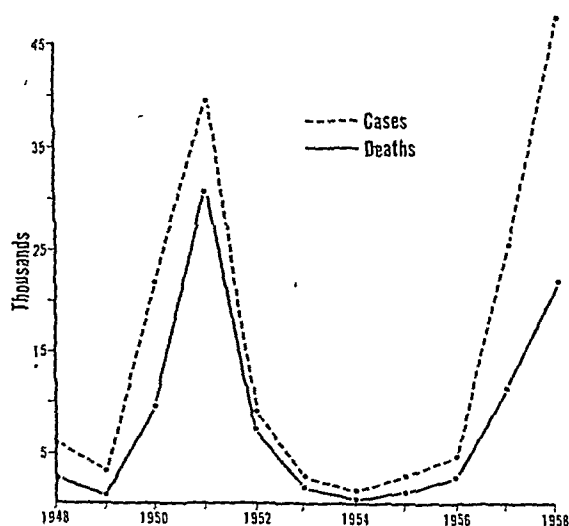
The 20-member team from Afghanistan performed vaccinations in the Dacca, Chittagor and Chandpur areas.

#### Smallpox in the Eastern Province

Epidemics of smallpox have occurred at intervals of a few years in East Pakistan (fig. 3). The epidemics are highly seasonal. Each year the Department of Public Health has made and distributed vaccine and has vaccinated on a large scale. The 5 to 16 million vaccinations reported per year from 1948 to 1957 would indicate that the population had a high degree of immunity. In spite of these reports, a major epidemic occurred.



**Figure 3. Smallpox cases and deaths, East Pakistan, 1948-58**



The vaccine routinely used was made by the vaccine laboratory in the Institute of Public Health and distributed in small cylindrical bottles stoppered with a cork. The vaccinator "wetted" the cork with vaccine, dabbed the arm, and made a circular scratch with a lancet sterilized in flame kindled by igniting cotton wool dipped in methylated spirits. For a primary vaccination this was done in two places on each arm. The vaccine was said to be potent for 7 to 10 days without refrigeration.

In a small way I checked on this procedure in two suburbs of Dacca, where people had been vaccinated 3 to 7 days before with vaccine kept for a week without refrigeration. Among 129 people, I saw only 2 whose vaccinations were not effective. Both were adults who had been previously vaccinated.

The CDC and the U.S. Navy teams recorded their evaluations of the situation in a series of reports which provide much of the data cited in this paper. In May, the CDC epidemiologists, each paired with a Pakistani doctor who acted as guide and interpreter, visited the various districts to inquire into the morbidity situation and to check the vaccination status. Vaccination rates were estimated by inspecting the scars on samples of the populations. The data had to be collected in great haste and for this reason are not suitable for analysis in great

detail, but nonetheless probably give a fair indication of the true situation. Seventeen percent of the sample group were found never to have been vaccinated, 22 percent to have old scars only, 41 percent to have been revaccinated in 1958, and 20 percent to have had primary takes in 1958. In a population of 46 million, this represents a substantial number of vaccinations.

Generally, the epidemiologists of the team felt that the statistics available on morbidity gave a true picture of the trends, even if the totals were not strictly accurate. They analyzed the number of deaths reported, since this figure was more likely to be accurate than the number of cases reported.

Briefly, they found that most of the deaths were in children under 10 years of age. They also discovered that chances of acquiring smallpox were related to vaccination history. Of 685 patients they studied, 19 had been vaccinated within the past 10 years, 207 had been protected for more than 10 years, and 459 had never been vaccinated.

The geographic distribution of cases was not uniform. The northeastern districts almost escaped the epidemic, the east central ones suffered heavily in 1957, and the western ones had the peak of their epidemic in 1958. In the Rajshahi and Dinajpur Districts, the CDC officers traced the spread of the infection along the railroad.

### Vaccinating During the Crisis

After the Chief Minister handed over epidemic control to the citizens committee, local nonmedical groups in every district took over the vaccinating. The medical colleges in Dacca were closed, and doctors and students spread out over the entire Province as volunteer vaccinators. They worked for 2 or 3 months, received only a bare subsistence allowance, and undoubtedly vaccinated many people, 300,000 in Dacca alone.

But their efforts were uncoordinated, and 200 or 300 ardent workers, even with the assistance of official vaccinators and 400 sanitary inspectors, could not protect 46 million people. The average vaccinator, working from house to house and stopping to persuade reluctant people, cannot average more than 100 inoculations



**At a roadblock in Comilla all passers-by are vaccinated against smallpox.**

a day. Travel on foot between villages and 1- to 3-day trips to and from Dacca lower the daily average substantially.

After 3 weeks of consideration, the Government and the epidemic control committee finally agreed on the following course of action: vaccinate 80 percent of the people within 6 months, stamp out the remaining traces of infection in the next 6 months, enforce the law requiring children to be vaccinated, and attempt to revaccinate the population every few years through an improved health service. The Government also agreed that during the initial phase, 1 volunteer per 1,000 people would be raised and trained through the local committees and that the Department of Public Health would be strengthened in time to undertake the second and succeeding phases.

The Government appealed for these local volunteers, 1 for each 1,000 persons, a total of 45,000. The task was great, but the scheme had the advantage that the people of each village or group of hamlets could be vaccinated by someone who knew them. Traveling expenses for such volunteers would be minimal and much of the resistance, especially from women in purdah, would be overcome. Doctors, students, and sanitary inspectors could instruct the volunteers instead of doing the vaccinating themselves.

By this time in May, more than 3,000 cases

and 1,300 deaths from smallpox and 600 deaths from cholera were reported every week. Already nearly 20 million persons had been vaccinated, and more than a million more were being vaccinated every week, but still this task was not being done quickly enough, and coverage was not sufficient. Therefore, a joint Pakistan-ICA-USIS team planned an additional campaign to cover the Province, district by district, over a 6-month period.

The team began work in the Tippera District. In the subdivision of Comilla they used a bagpipe band from the Frontier Force to attract crowds to the stadium for health shows. Crowds of thousands attended two evening mass demonstrations and a number of enthusiastic youths volunteered to be trained as vaccinators. But the volunteers were of little use; a hundred turned up the first day to do the vaccinating, a handful the next day, and only one on the third day.

Although the operation was a failure in the number of vaccinations performed, the team found out which types of health information campaigns were practical, the willingness of the people to collaborate, the difficulties of travel, the local resources, and the most feasible ways of distributing vaccine and training volunteers.

In subsequent programs, audiences, mostly all male, at the night health shows ranged from 2,000 to 10,000. In Dinajpur the women were persuaded to attend by dividing the field in two with a bamboo fence to separate the sexes.

The teams spent daylight hours meeting with committees, giving speeches over a loudspeaker mounted on a car, and distributing pamphlets. Frequently, as the teams drove along a lonely road bordered by fields of jute or rice stretching for miles, they stopped the cars and blew the horns. At the sound, figures wearing enormous sun hats popped out of the fields of rice or jute and a few started to run toward the car. In 5 minutes a fair-sized crowd assembled to hear a talk on smallpox and vaccination.

Brahmanbaria, another subdivision of Tippera, with a population of 1 million, provided a heartening contrast to the experience in Comilla. The Pakistan-ICA-USIS team could spend only a day there consulting with the subdivisional officer and the subdivisional health officer, a sanitary inspector. These two men

had only a jeep, very little money, and a handful of sanitary inspectors and vaccinators to cover a large territory with few roads. However, they looked for volunteers who were disciplined, intelligent, educated, and available in large numbers. They found them in the school children.

The children easily picked up the vaccination technique from their teachers, who were trained by the sanitary inspectors. The teams of children, supervised by their teachers, worked in the villages around their schools. They did not need transportation and were welcomed by everyone, including women in purdah. When the CDC team made its evaluation a month later, they found that more than 80 percent of the population sampled had been vaccinated.

The successful campaign in Brahmanbaria demonstrated that mass vaccination is not basically a medical undertaking but a layman's job of organization, propaganda, and logistics. In subsequent months this was proved over and over; wherever the administrative officers took personal charge, the vaccinating was effective, but where they were uninterested, the campaigns were failures.

## The Vaccine

Most of the vaccine sent to East Pakistan was the lymph type, requiring refrigeration. The Government of East Pakistan requisitioned the only cold-storage facility in Dacca to store it as it arrived by air. Batches packed in dry ice often arrived with the dry ice surviving and, whenever possible, were forwarded with the packing undisturbed to field stations. Some dry ice was still unevaporated when packages reached places a day's journey from Dacca.

According to the manufacturers, the vaccine would remain potent 2 to 3 days without refrigeration, but in our experience, most of it involuntary, the vaccine was effective for a week or more in temperatures of 80°-100° F. The packaging of the vaccine from the United States was bulky; 50,000 doses occupied the same space as a million doses of the local product, and this was a big handicap, for refrigerators were very scarce.

In addition to the vaccine sent to Pakistan,

the vaccine laboratory of the Institute of Public Health obtained an adequate supply of calves and, by May, was turning out 1 million doses a week. A laboratory in Lahore, West Pakistan, supplied 500,000 doses weekly. The U.S.S.R. team suggested two Soviet dry vaccine plants were available should the Pakistan Government wish to accept them. The Navy team made a dry vaccine from a chick embryo growth with an apparatus used by the Department of Agriculture to prepare rinderpest vaccine. The United States, through ICA, offered a dry vaccine plant capable of processing 500,000 doses a week, and the Pakistan Government accepted it.

Dry vaccine remains potent without refrigeration much longer than the wet type, and its advantages where travel is difficult and refrigerators are scarce are obvious.

Vaccination stylets were in short supply, so at first the needles which came with the vaccine from the United States were used with vaccine from other countries. Then the United States team suggested using a large steel sewing needle which would be given to the person who was vaccinated with it. The needles are valued by the people in Pakistan, and their use eliminated channels of cross-infection and the nuisance of sterilizing instruments. In June ICA sent 11 million sewing needles.

The technique of vaccination was streamlined. We stopped swabbing the arm before inoculation because of the shortage of cotton wool and alcohol and no cross-infections were reported. The bandage at the inoculation site was also eliminated. With wet vaccine, the bottle was given a shake and the dampened cork applied to the arm. The dry vaccine bottles lacked stoppers, so the needle was dipped in the bottle and a drop taken out.

The method taught was the multiple pressure technique of vaccinating, but some vaccinators made punctures, some, long scratches, some, elaborate crosshatchings, and some did as they were taught. All methods seemed to work if the vaccine was fresh and potent. In the campaign we accepted no contraindications to vaccination, for the risk of infection was too great.

The diversified sources of the vaccine gave us a chance to compare the potency and various

fashions of packaging. The Navy team has reported on comparisons of potency.

For vaccine to be used under conditions similar to those in East Pakistan, the following requirements are recommended for convenience in handling. The vaccine should be dry. Each ampoule or bottle of vaccine should contain about 1 day's supply, approximately 100 doses. The bottle should be sturdy, flat bottomed so that it can stand alone, and have a mouth wide enough to make the transfer of the diluent easy.

The diluent containers should not be stoppered with corks or screw tops which leak during shipment by air. A minimum of glass-cutting should be required to open them. The device holding the stopper in place should be simple to remove. The fluid should be transferable without syringes or pipettes.

Bottles for the reconstituted vaccine should have stoppers which can be used as applicators. Special applicators are easily lost. Some substance should be added to prevent growth of contaminating bacteria.

The instructions and the expiration date with the name of the month, rather than the number, should be written in a language familiar to the person using the vaccine. The expiration date should be on each bottle. The package containing the bottles should be strong, easy to open, and include all essential items so that it is ready for distribution.

### The Cholera Epidemic

In East Pakistan cholera appears in dry weather, reaches a peak in May, and disappears with the first rains. The Province normally has several hundred deaths from cholera each week in May (figs. 1 and 4).

The vaccine in present use requires two injections of 0.5 ml. and protects only for 6 months, but in India, it is customary to give one dose of 1.0 ml. Semiyearly immunizations were simply not practical in East Pakistan.

Although many inoculations were given, the Department of Public Health concentrated on distributing drugs to treat cholera. However, medical staffs are spread very thinly over the Province and transportation for them or for patients is scarce. A trip to a hospital might

mean carrying a patient many miles by bullock cart over the rice paddies, so that the chances of a patient being seen by a medical person were very small. In the middle of the outbreak, a visit was paid to the cholera ward in Barisal, which was found empty, although stricken villages were reported from all sections of the surrounding district.

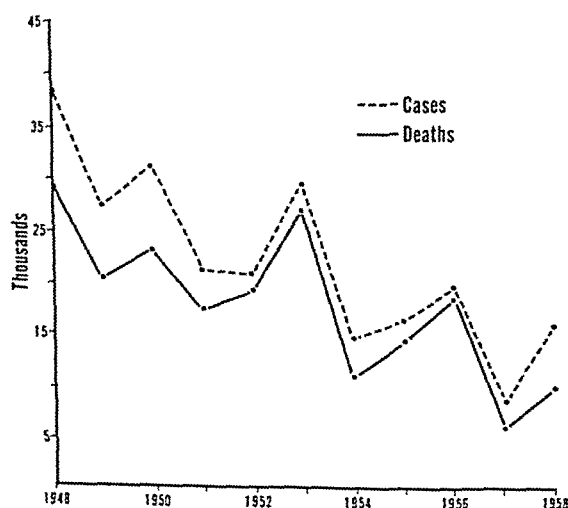
The Department of Public Health sent mobile teams to affected villages, but since reporting of the outbreaks took several days, the patients were either dead or convalescent by the time the teams reached them. Often, many people in a village became ill at once; a week or 10 days later another village some distance away would be stricken.

Cholera reporting since 1948 appears to be inadequate; cases about equaled deaths, although in 1958 the fatality rate was 40 percent.

Diagnosis can be difficult and in 1958, physicians called almost every case of diarrhea a case of cholera. The U.S.S.R. and Navy teams studied cases in hospitals and concluded that perhaps 50 percent of the cases in the cholera wards were due to other infections.

Both teams had difficulty finding fresh cases; patients admitted to the hospitals were convalescent and had already been treated in a variety of ways. The Navy team isolated *Vibrio cholerae* from nine patients in a cholera ward and five apparently healthy contacts in a Dacca

Figure 4. Cholera cases and deaths, East Pakistan, 1948-58



suburb. The isolates had these characteristics in common: they fermented sucrose and mannose but not arabinose, were positive in the cholera red test and negative in the Voges-Proskauer and hemolysis tests, and serologically were of the Ogawa type.

Preventive measures against cholera in other countries depend on safe water, good hygiene, and efficient sewage disposal. The Pakistan Government, with ICA help, is trying to provide piped water in the larger towns, large-bore tube wells in the smaller ones, and smaller tube wells for the villages. However, it may be 10 years before the general population has wells and the average villager is persuaded to abandon his tank for washing and drinking water.

### Epidemiology of Cholera

Bengal has the unenviable distinction of being the home of cholera and quite possibly is the only place on earth where the infection can exist all year round decade after decade. Cholera is endemic only in Asia. The U.S.S.R. team, which had been operating in China, stated that all the epidemics in the U.S.S.R. and China were imported from outside those countries. In the Indian subcontinent, the disease is found all year round only in Bengal.

Cholera first appeared on record in severe epidemic form in 1817 in the Calcutta area. Four times in the 19th century it appeared in a series of waves around the world, and these major pandemics were traced back to Bengal. There are possibly smaller foci elsewhere in southeast Asia, but the Bengal area, which the 1947 partition divided between India and Pakistan, is the only major endemic focus. If cholera could be eliminated there, it seems likely that it would disappear entirely from the world. However, the epidemiology of the disease has not been worked out completely, although obviously it is associated with unhygienic conditions.

Why is cholera endemic in so limited an area? A possible answer lies in the nature of the country—the flat, waterlogged land, the dry season and the monsoon season, and the water tanks which are centers of community life. The paths of spread of the cholera pathogen in an average Bengal village are numerous, but all

are insignificant compared with the massive potentialities of these tanks.

The distribution of cholera in East Pakistan supports the theory that the tanks are related to the maintenance of the infection. In the northern districts and the higher areas where tanks are not so common, cholera apparently occurs only during the epidemic dry season. In the low southern districts, where tanks surround every hamlet, the disease persists year round.

Traditionally, cholera disappears in Bengal with the onset of the monsoon. During the 1958 monsoon season outbreaks of cholera reported in Noakhali and Faridpur, upon investigation, seemed to be genuine, indicating the infection to be endemic there in spite of the monsoon. With the appearance of the dry weather in October 1958, the cholera soon shot up alarmingly to a maximum of 700 cases a week, but the rains in January 1959 were heavier than usual, and almost immediately the cholera dwindled. In February 1959 a local epidemic in Comilla occurred, but following some unseasonable rains, the disease again disappeared. In March the whole area had heavy rainfall and the cholera sank to an extremely low level for this time of year.

*V. cholerae*, recently isolated, can grow in a decidedly alkaline media. It is difficult to concede that this unusual cultural requirement is purely nonadaptive, so it is natural to look for some environment where the pressures of natural selection result in the production of such a characteristic.

One can speculate on these facts. If the tanks are the basic reason the infection is localized to Bengal, the disease spreading from there to other parts of the world, then possibly changes in the alkalinity of the water in the tanks might account for epidemiological differences between the dry and wet seasons as well as the requirements of the organism. Perhaps the first rains stop the main avenue of transmission by altering the pH of the water in the tanks.

Studies are in progress to see if there is a positive correlation between the pH of the tank water in different periods of the year and the incidence of cholera. Preliminary studies in the dry season have already shown that tank



A physician from the Communicable Disease Center and his companion, a Pakistani physician, prepare to give inoculations against cholera.

water commonly has a pH much in excess of 8, which would favor the cholera organisms. Following a few days of dry weather, the pH before dawn is between 7.0 and 7.5 and by evening can be as high as 9.5 or 10.0. It is known that pH in such waters is largely dependent on the activity of algae that produce either oxygen or carbon dioxide according to the degree of light available, and that considerable changes take place between night and day. The rainfalls theoretically could reduce the pH both by the clouds reducing the sunlight and, even more, by dilution or making the water muddy. During the dry season, all ponds become almost saturated with algae. On rainy days, the pH does not commonly rise above 8.4, the optimum for *V. cholerae*. If it should be proved that the pH is altered markedly by the monsoon or heavy rains, a reasonable explanation can be given for the known facts of the epidemiology of the infection as well as the cultural requirement of the organism.

Whether cholera has long-term carriers is not yet clear. The Soviet team said they had found

people excreting organisms for 2 months and in one instance for 1½ years. However, it is difficult to test the pathogenicity of organisms recovered from carriers. It would not be necessary for carriers to excrete organisms for more than 3 months for the organism to survive permanently in south Bengal.

At present, hope of controlling and eradicating cholera depends on providing safe drinking water and convincing people of the importance of hygienic measures. Immunization is a weak barrier and the value of bacteriophage remains unproved. In East Pakistan the trend of the disease is downward (fig. 4), which gives hope that environmental changes might be leading to its extinction.

#### Epidemiology of Smallpox

Smallpox in southeast Asia was clearly described by Chinese writers 4,000 years ago, and, according to 3,000-year-old scripts such as the Susruta, Indian Ayurvedic physicians were also familiar with it.

The history of smallpox in East Pakistan is marked by substantial epidemics which last for about 3 years, recurrence at intervals of 5 or 6 years, and seasonality. Substantial 3-year epidemics occurred in the early 1940's, the beginning of the 1950's, and in 1957-58. Smallpox is a disease of the early months of the year. Its Bengali name, *basanta*, means "the spring-time."

The apparent explanation of the recurring epidemics is that smallpox is following the same cyclic type of pattern as measles in the Western countries. An epidemic leaves few susceptibles so that another cannot occur until a fresh crop of susceptibles appears. This concept is supported by the fact that most deaths are among children under 10 years of age, and 40 percent of the mortality is among those under 5 years.

But the matter is not so simple. Even in the worst epidemics in East Pakistan, the total number of cases is under 100,000 a year, while the babies born each year are counted in millions. For the infection to immunize enough people during an epidemic to produce a cyclic pattern, a considerable number of inapparent

infections would have to be postulated for each case of smallpox.

This happens in many other infections but, as far as I know, it has not been demonstrated in smallpox. However, the fluctuations in the immunity status of the population necessary for cyclic epidemics are probably provided by other factors, the vaccinator and his vaccine.

Each year millions of vaccinations are performed by the public health services, but the number depends on the epidemic conditions of that particular year. Ten million persons may be protected if there is an epidemic scare but only 2 or 3 million in nonepidemic years. Immunity given by vaccination in step with the epidemics may produce the cycles that are so prominent in East Pakistan.

Smallpox is easy to prevent; vaccination is simple and can be done by illiterate people. The vaccine is cheap and can be mass-produced. It should be possible for each country in southeast Asia to vaccinate 90 percent of its people within a year and to repeat the operation every 3 to 5 years. The resulting level of immunity would probably cause the disease to disappear completely.

## FDA Warning on Irregular Use of Diabetes Test Papers

The use of certain chemically treated diabetes test papers by women to determine the fertility cycle may be injurious, according to the Food and Drug Administration. Some of these test papers contain the chemical toluidine, which has not been adequately tested for its effects on the sensitive tissues of the female reproductive system.

The papers are marketed for use by diabetics, who are able to determine the presence of sugar in the urine by moistening the paper with a small amount of urine. The chemically treated papers change color if sugar is present. No question has been raised about the safety of this procedure for diabetes.

It has been reported, however, that the secretions of the cervix also contain enough sugar during the ovulation period to cause the test paper to change color. This has resulted in publicizing the use of test papers for determining the fertile period of the menstrual cycle.

The Food and Drug Administration emphasized that the use of the chemically treated papers to determine the fertility cycle should be discontinued until appropriate tests have shown that the procedure will not cause injury to sensitive tissues.

# The Feasibility of Smallpox Eradication

GLENN S. USHER, M.D., M.P.H.

**I**N JUNE 1958 the World Health Organization gave consideration to a proposal that it undertake a worldwide smallpox eradication program. The proposal was approved in principle, and the Director General was instructed to study the feasibility and possible means of accomplishing the task.

WHO's action lends timely interest to smallpox control experiences such as a group from the Communicable Disease Center of the Public Health Service had in the spring of 1958 in East Pakistan. This Province, formerly known as East Bengal, has long been known as a stronghold of smallpox and a place where control efforts are beset with difficulties as great as any to be found in the world. If eradication of the disease is feasible in the circumstances presently existing there, it should be feasible anywhere.

The occasion for the CDC team's trip was a smallpox epidemic of alarming proportions. Many countries, including the United States, extended assistance in combating both this epidemic and a cholera epidemic that was raging concurrently. U.S. assistance was coordinated by the International Cooperation Administration's Mission in East Pakistan under the direction of Dr. Thomas A. Cockburn, ICA's public health adviser in Dacca.

This team reported to Dr. Cockburn and with him to the Minister of Health and Home Government of East Pakistan. It was assigned the task of serving as the "eyes and ears" of the smallpox control campaign with the following duties:

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1. Study the history and characteristics of smallpox epidemics in East Pakistan and the various related factors.

2. Define the nature, extent, and distribution of the smallpox epidemic.

3. Assess the resources that could be brought to bear on the control of the epidemic and the obstacles to be overcome.

4. Evaluate the current control campaigns in the districts and identify areas of success and failure.

5. Identify, in cooperation with Pakistani health personnel, epidemiological factors of importance to the smallpox control program.

In the execution of these duties the need to obtain data that would be as nearly representative as possible of the entire Province led to field trips to all 17 of its districts. Team members traveled by airplane, train, river steamer, jeep, oxcart, rickshaw, "country boat," and on foot. On most trips each of us was accompanied by a young Pakistani physician who had volunteered his assistance. The associations with these dedicated young men turned out to be most rewarding both to them and to us.

It is not the purpose of this paper to describe the control campaign that was conducted or the activities of the team. Some of our observations, however, are pertinent to the question of whether it would be feasible to attempt eradication of smallpox in East Pakistan at this time, and what would be required in order to achieve this goal.

## Two Crucial Factors

The history of smallpox in Bengal and East Pakistan may be seen at a glance in figures 1 and 2. For as far back as records have been kept, the disease has occurred in cyclic waves. Figure 1 illustrates these cycles for the period 1912-46 in all of Bengal prior to the 1947 par-



tion. Figure 2 shows the smallpox deaths in East Pakistan from 1948 to 1958.

From these data may be derived the first crucial factor of the problem: smallpox is deeply entrenched in East Pakistan as an endemic and epidemic disease. Despite the fact that much vaccinating has been done (small sampling surveys performed by the team demonstrated that 60 to 90 percent of the population had been vaccinated), epidemics continue to recur in cyclic waves.

The other crucial factor of the situation is the extreme density of the population, which obviously must have great significance in maintaining the endemicity and epidemicity of the disease. With 45 million people crowded into a land area slightly smaller than the State of Illinois, the average population density is 777 persons per square mile.

#### "Density of Susceptibles" Concept

The significance of East Pakistan's great population density is demonstrated by the team's study of the manner in which the 1958 epidemic developed and peaked.

This epidemic was not a sudden occurrence. Although figure 2 shows the increased incidence for the Province as a whole starting in 1956, reports by district that were available to the team showed that the increase in Dacca started as early as 1955. From that year until 1958 there was a gradual buildup of the epidemic. Dacca and Tippera Districts are the most populous of the Province's 17 districts, with population densities of about 1,500 persons per square mile.

The appearance of conspicuous numbers of smallpox deaths in Dacca District was followed by similar occurrences in 1956 in Tippera District and in a few of the other more populous districts. The peak of the epidemic was reached in Dacca, Tippera, and two other districts in the spring of 1957, a full year before the peak of the epidemic in the Province as a whole. Conversely, the most sparsely populated district, Chittagong Hill Tracts, remained essentially epidemic free throughout the entire period. Only a few sporadic deaths were reported in 1958.

The team made a few samplings of the vacci-

Figure 1. Deaths per 1,000 population from smallpox in Bengal, 1912-46

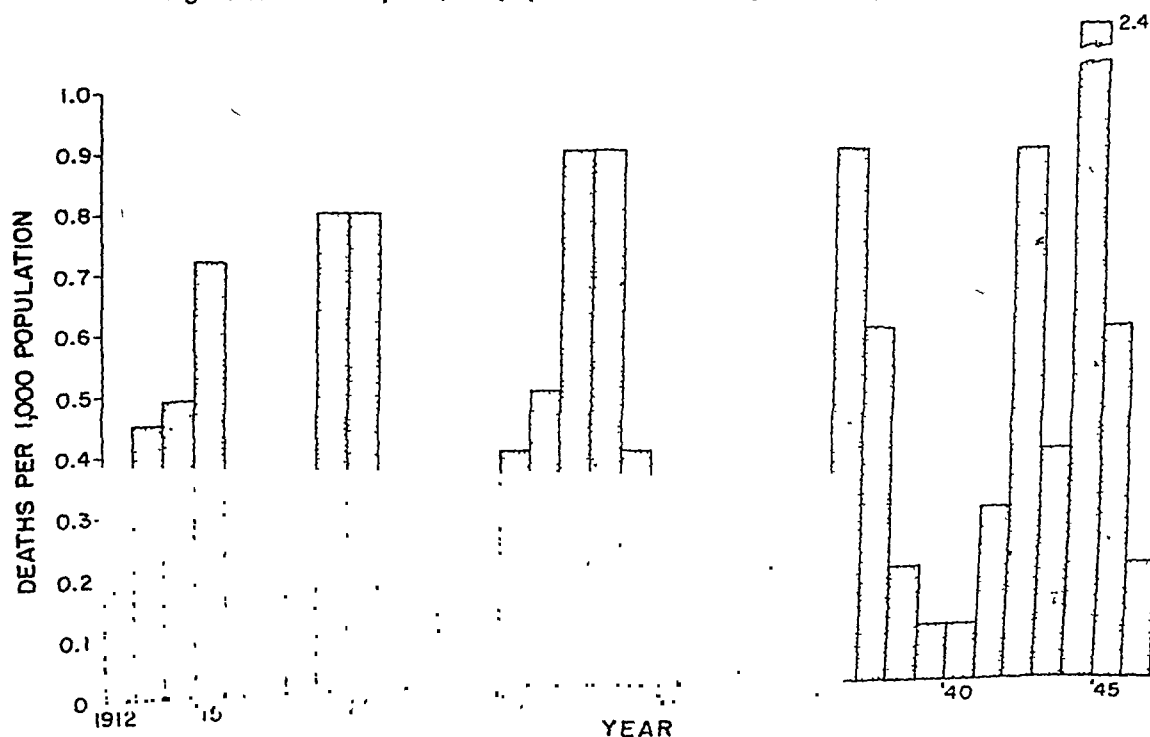
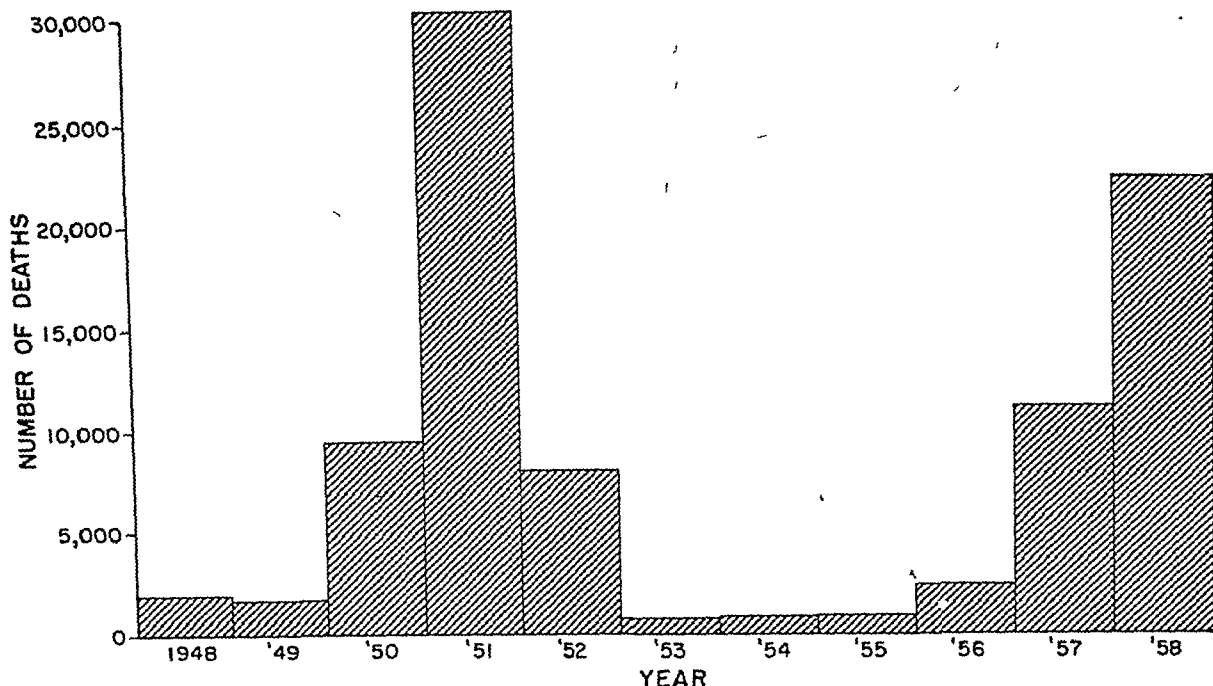


Figure 2. Deaths from smallpox in East Pakistan, 1948-58



nation status of the people in most of the districts, as evidenced by the proportion of persons having vaccination scars. On the basis of these surveys, the team made some very crude estimates (the best we could do in the available time) of the proportions of the district populations that had been vaccinated. These estimates ranged from about 60 to 90 percent (including old vaccinations), but we were unable to find any correlation between the proportion of the population that had been vaccinated and either the time of onset or the intensity of the epidemic in various districts.

As a result of the observations described in the preceding three paragraphs, it was the team's impression that, within this 60-90 percent range of proportions of persons vaccinated, both the time of epidemic onset and the intensity of the epidemic were more closely related to population density than to vaccination status. This conclusion leads to the suggestion that the density, that is, the number per square mile, of unvaccinated persons would be a better index of the susceptibility of East Pakistan's dense population to a smallpox epidemic than the index that is ordinarily used, the proportion of the population that has been vaccinated.

This, of course, is the well-known concept of the density of susceptibles. It should be useful in identifying sections of the country where vaccination campaigns need to be intensified.

#### Age, Sex, and Social Groups

Although the density of susceptibles is believed to be a better indicator than the proportion of vaccinated persons, it is admittedly only a crude index of the vulnerability of a population to smallpox epidemics. Obviously of great importance also is the uniformity of distribution of susceptibles among various segments of the population, such as age, sex, and social groups. If there are excessive numbers of susceptible persons in one or more of these population segments, their excessive vulnerability would be expected to result in a greater degree of vulnerability of the total population than the mean density of susceptibles would indicate.

In the East Pakistan epidemic we found that children under 10 years of age were not as well vaccinated as older age groups. This fact was reflected in the age distribution of cases and deaths (table 1). It was clear that special attention needed to be given to improving the vaccination status of children.

**Table 1. Age distribution of smallpox cases and deaths in Mitford Hospital, Dacca, and in selected districts, East Pakistan, January-May 1958**

Age group (years)	Cases			Deaths				
	Mitford Hospital	Pabna District	Total	Mitford Hospital	Tippera District	Faridpur District	Dinajpur District	Total
0-1.....	4	49	53	2	34	16	37	89
1-4.....	32	245	277	17	199	122	236	574
5-9.....	32	209	241	12	121	125	152	410
10-11.....	25	77	102	11	19	26	22	78
15-19.....	21	32	53	10	21	16	12	59
20-29.....	63			24	43	53	11	131
30-39.....	27			9	33	44	10	96
40-49.....	15	307	422	4	32	30	8	74
50-59.....	6			2	36	17	2	57
60 and over.....	4			2	36	11	1	50
Total.....	229	919	1, 148	93	574	460	491	1, 618

Since Moslem women of Pakistan are in purdah and consequently lead a secluded life, the team expected to find substantial differences in the vaccination status and prevalence of the disease in the two sexes. This, however, did not turn out to be the case. Sampling surveys revealed approximately equal proportions of unvaccinated persons in males and females. Table 2 shows that in the areas studied, except for Mitford Hospital, the male and female cases and deaths were approximately equal. (Field observations failed to lend credence to the suspicion that the seclusion of women might result in their cases and deaths being less well reported than those of men.)

**Table 2. Sex distribution of smallpox cases and deaths in Mitford Hospital, Dacca, and in selected districts, East Pakistan, January-May 1958**

District	Males		Females	
	Cases	Deaths	Cases	Deaths
Mitford Hospital, Dacca.....	142	57	87	36
Noakhali.....	350	82	417	98
Pabna.....	478		441	
Dinajpur.....		217		244
Faridpur.....		238		222
Total.....	970	624	945	600

The many religious sects and social groups of East Pakistan have sharply contrasting customs and habits of social behavior. Time did not permit a comparative study of the occurrence of smallpox in them and its relationship to population density and vaccination status. However, in conversations with local health officials the CDC team learned that some groups had responded poorly to vaccination campaigns and experienced high smallpox attack rates. Vaccination programs need to be intensified in localities where these groups reside.

#### From Control to Eradication

It has been said that when vaccination of 80 percent of the population has been achieved, smallpox will die out. In our opinion this is an oversimplification. In the more densely populated parts of East Pakistan it seems likely that a substantially higher percent of recently vaccinated persons would need to be achieved in order to eradicate smallpox by mass vaccination alone, and that this vaccination status would need to be maintained for several years.

Because of the extreme difficulty of accomplishing this in a country like East Pakistan, the surveillance phase of the eradication program should be introduced at an early stage—as soon, in fact, as the incidence of the disease has been reduced to a level where it becomes feasible to undertake emergency containment of each small outbreak as it occurs. Initiation

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## CDC Team

Members of the Communicable Disease Center team who participated in the collection and analysis of the data referred to in this paper were, in addition to Dr. Usher, Dr. Alexander Langmuir, chief, Epidemiology Branch of CDC; Dr. Frederick L. Dunn; Dr. Jacob A. Brody; Dr. Malcolm I. Page; Dr. Chandler R. Dawson; Dr. James W. Mosley; Dr. W. Yates Trotter; and Dr. H. Bruce Dull.

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of this phase of the program should be timed to take advantage of the low incidence of an interepidemic period.

This is the manner in which smallpox was eradicated in the United States. Although it apparently was not accomplished by following a consciously conceived plan, what happened was that in the relatively sparse population of the United States it proved to be possible to reduce the density of susceptibles, and consequently the incidence of the disease, to a very low level by the vaccination of a smaller proportion of the population than would be necessary in East Pakistan. Thereafter it became possible to regard the occurrence of a case of smallpox as an emergency calling for immediate vaccination of the entire community. An especially dramatic example of this was the 1947 incident in New York City when the recognition of 12 cases of smallpox led to the vaccination of some 7 million people within a month.

In the surveillance or "firefighting" phase of an eradication program selective vaccinating of exposed persons (sometimes referred to as "ring containment") is, of course, desirable, but it is not considered advisable to rely entirely upon this for the emergency containment of outbreaks. This is especially true in a country like East Pakistan where health services are not fully developed, and there is a shortage of qualified health personnel for the performance of contact investigations. In such circumstances it seems essential to rely primarily upon "area containment," that is, an immediate, very intensive campaign to raise to the highest possible level the vaccination status of a community where an outbreak has occurred.

The successful execution of the "firefighting" phase of the eradication program in a country where the problem is as difficult as it is in East Pakistan may require rather drastic measures, such as area quarantine, during the time required to vaccinate a community in which an outbreak has occurred. Enforcement of emergency measures will need to be determined and persistent.

### Is It Feasible?

Although the required strategic concept is simple and the technical procedures are not complex, the successful implementation of such a program in East Pakistan will not be easy. Traditionally, intensive vaccination activity there occurs only during epidemics. In inter-epidemic periods vaccinations continue at a more leisurely pace. To continue intensive vaccination activity when an epidemic is not raging would require understanding and sustained support by officials in the highest levels of the Government who have the responsibility of appropriating the funds to keep the work going. Furthermore, when it becomes necessary to apply drastic measures in the second phase of the program (the firefighting phase) there must be public understanding of the need for them.

Difficult problems of logistics also are involved. Transportation and communications facilities in East Pakistan are very poor. Personnel engaged in this program would need to be given priority use of those that are available, and funds are needed for purchase and repair of vehicles.

Where wet lymph is used, additional and improved facilities are needed for its refrigeration right up to the time when it is used in order to maintain its full potency. In some isolated sections of the country it seems essential that dried vaccine be used and perhaps consideration should be given to using dried vaccine exclusively. Whatever type of vaccine is used, it is essential that it be packaged in such a manner as to permit its satisfactory use by nontechnical personnel with little manual dexterity. For example, it is impractical to use a vaccine packaged in a vial that requires filing off a glass tip.

These are the requirements that appear to be crucial. The CDC team arrived at the opinion that the problems, although difficult, are not in-

surmountable. Eradication of smallpox in East Pakistan will be a difficult task, but it is considered feasible to undertake it at this time.

### Summary and Conclusion

A proposal that the World Health Organization undertake a program of worldwide smallpox eradication is under study at the present time. The feasibility of such an undertaking under presently existing circumstances is dependent on the likelihood of success in countries where eradication is likely to be most difficult to accomplish and the obstacles greatest. One of these countries is Pakistan, in whose Eastern Province smallpox is deeply entrenched as an endemic and epidemic disease.

In 1958 a team of epidemiologists from the Communicable Disease Center of the Public Health Service was assigned to the International Cooperation Administration to participate in the assistance that the latter was extend-

ing to the Government of Pakistan in combating a smallpox epidemic in East Pakistan. Some of the observations of this team are pertinent to the question of whether it would be feasible at this time to attempt the eradication of smallpox in the Province.

It is concluded that such an undertaking is feasible at this time if certain problems are recognized and successfully dealt with. The concept of "density of susceptibles" is postulated, and certain other factors bearing on the problem are discussed. It is suggested that the strategic plan would need to be the same one that has led to the eradication of smallpox elsewhere, namely, reduction of prevalence by means of widespread vaccination, followed by surveillance and emergency containment of each outbreak as it occurs. For the latter it is believed that primary reliance should be placed on "area containment" rather than "ring containment."

## PUBLICATION ANNOUNCEMENTS

Address inquiries to the publisher or sponsoring agency. WHO publications may be obtained from the Columbia University Press, International Documents Service, 2960 Broadway, New York 27, N.Y.

*Home Nursing Handbook.* 1959; 29 pages. Metropolitan Life Insurance Co., Health and Welfare Division, 1 Madison Ave., New York 1, N.Y.

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*Current Research and Development in Scientific Documentation, No. 5.* Office of Science Information Service, National Science Foundation. NSF 59-54. October 1959; 102 pages; 50 cents. Superintendent of Documents, U.S. Government Printing Office, Washington 25, D.C.

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# Conservation of Air Resources

FRANK TETZLAFF, M.C.E.

AIR POLLUTION has been defined as the presence in the air around us of substances put there by the activities of man in concentrations sufficient to interfere directly or indirectly with our comfort, safety, or health, or with the full use and enjoyment of our property (1). In many communities the simultaneous outpouring of many particles, fumes, dusts, vapors, gases, and ash, and the subsequent interactions of these pollutants in the atmosphere have created prolonged irritative effects on people; damaged vegetation, livestock, and structural and other materials; decreased visibility, with hazards to air and ground transportation; and impaired property values. Estimates of the probable cost to the communities of some of these effects have ranged from \$10 to \$65 annually for each person (2). But large as this figure may seem, it still does not include the cost of esthetic deterioration, the damage to the general fitness of the environment, and the desirability of the community as a place to live, to all of which it would be difficult to assign a dollar value.

The communities in the United States with long-established smoke abatement programs are relatively few. Many such programs have only recently begun, notably with the industrial and community expansion emerging during World War II. The U.S. Bureau of the Census statistics show that the growth of metropolitan areas

in the United States has crowded over one-half of our present population of more than 175 million into some 180 metropolitan areas, less than 10 percent of the land area. The tendency to urbanization will continue, with further complications of air pollution.

No single factor can be charged with full or principal responsibility for air pollution. Many common and essential activities contribute. While automobile exhausts may be significant in one community or in one part of town, industrial fumes and vapors may be disturbing elsewhere. In many large cities, garbage and refuse incinerators in apartment houses or even backyard incinerators have been major contributors. Municipal incinerators, powerplants, steel mills, ore smelters, and petroleum refineries are serious sources when improperly operated or lacking devices to control dust, smoke, or other discharges. Certainly operations such as the burning of open garbage and refuse dumps and the uncontrolled burning of automobile bodies in metal salvaging operations are offensive practices.

Although the effects of air pollution are generally subtle and difficult to measure, they can be apparent and even disastrous (3, 4).

The growing concern with air pollution has resulted in Federal legislation authorizing the Public Health Service to conduct a program of research and technical assistance (5). Since efforts to control air pollution have been hindered by the lack of technical knowledge concerning the causes, effects, and practical control measures, major emphasis has been placed on research.

In developing air pollution research, the Public Health Service has enlisted the aid of other Federal agencies, universities, and research in-

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*Mr. Tetzlaff is chief, Air Pollution Engineering Branch, Division of Engineering Services, Bureau of State Services, Public Health Service. This article was excerpted and updated from a paper presented at the annual convention of the General Federation of Women's Clubs, held in Hollywood, Calif., June 5, 1959.*

stitutions in every part of the country. Some studies are designed to determine which air pollutants, if any, cause or intensify specific disease conditions or otherwise adversely effect the population (6). Through such studies, we may learn what pollutants must be removed from the air and what elements may be safely ignored. By observing the effects of polluted air in the laboratory and on human beings over a considerable period of time, sound conclusions can be reached. Significant leads have been uncovered. There is evidence of a relationship between air pollution levels and mortality rates from stomach and lung cancer, with allowance being made for smoking habits (7). We know that there are pollutants in urban air which can produce cancer in experimental animals.

A followup study on the population of Donora, Pa., has shown that the people who were made ill by the air pollution disaster in 1948 have had poorer health in general and higher mortality rates these past 10 years than their neighbors who were apparently unaffected. Many who died during acute air pollution episodes in London, Donora, and the Meuse Valley were elderly people with preexisting respiratory or cardiac difficulties.

Research in Great Britain has shown a direct relationship between air pollution and chronic bronchitis, a serious disease ranking third among causes of death in England and first among causes of economic loss due to illness (8). We have reason to believe that chronic bronchitis is also on the increase in this country (9).

During the past 4 years, the Public Health Service has established a national air-sampling network which for the first time permits a systematic measurement of air pollution throughout the United States. At present, the network consists of some 230 sampling stations, all manned by cooperating State and local agencies.

New methods of analyzing pollutants have been developed including the use of chemical, physical, and biological means which are proving to be more accurate and economical. Air pollution effects from specific industrial or community activities, such as oil refining, burning of municipal wastes, and operation of motor vehicles, are being evaluated. Fundamental studies are being conducted of the re-

lationship between weather conditions and the buildup of pollutants in the atmosphere. A method is being developed for forecasting weather conditions which permit the abnormal concentration of pollutants.

An automobile exhaust test facility developed by this program is becoming recognized as one of the best in the country. It permits simultaneous study of divers factors concerned with fuel and engine variables as they relate to the effects of irradiated auto exhaust on plants and animals.

For work on air pollution, short-term training courses are being given for personnel in health agencies. In addition, grants-in-aid have been made to 10 universities for the development and support of graduate level courses. Technical assistance on specific air pollution problems has been provided to State and local government agencies and other organizations.

Congress, in passing Federal legislation on air pollution, reserved to the States and local communities the responsibility for controlling air pollution within their jurisdictions. With the growing interest in conserving the Nation's air resources, States and communities have been surveying their air pollution position. Within the last 10 years, more than 20 States have adopted or modified legislation in this field. An increasing amount of legislative activity has also been observed in municipalities.

No modern city can hope to be completely free of air pollution. Industrial activities necessarily produce vapors, dusts, or gases which slip by the most effective control and retention devices now known. To require industry to establish absolute restraint of such byproducts can easily impose an intolerable economic burden.

There is a need for health agencies to determine the maximum concentrations of pollutants permissible and to apply these standards. This degree of control undoubtedly will prove costly, but it is no longer a question of whether we can afford to conserve the air. We cannot afford not to. It is the breath of life.

It is for this reason that continued research into the effects of air pollution is so vital. New knowledge may show that the application of controls which on the surface appear expen-

sive may actually save as yet unmeasured costs of damage to life and property caused by air pollution.

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### First Aid Reminder

#### *Mouth-To-Nose*

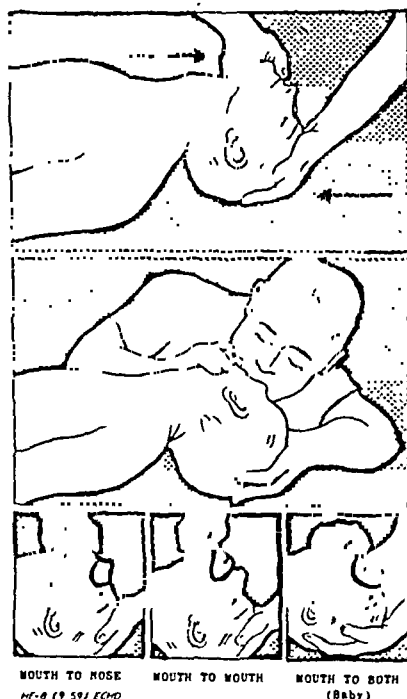
and

#### **Mouth-to-Mouth Rescue Breathing**

VICTIM ON HIS BACK IMMEDIATELY	
CLEAR THROAT	of water, mucus, toys, coins, or food
TILT HEAD BACK	as far as possible
PULL CHIN	to keep his tongue out of air passage
BLOW	air through nose or mouth (or both) until his chest rises
LISTEN	for snoring and gurgling - signs of throat obstruction.
REPEAT	10 - 20 times per minute

**Continue Rescue Breathing Until He Breathes For Himself.**

DISTRIBUTED BY  
ERIE COUNTY HEALTH DEPT.  
Wm. E. Mosher, M.D., M.P.H.  
COMMISSIONER  
601 CITY HALL, BUFFALO 2, N.Y.



Rescue breathing instructions, printed on handy wallet-sized cards, have been distributed by the Erie County (N.Y.) Health Department. Both sides of the card are reproduced, actual size, in the illustration above.



## *Status of Public Health Officials*

**B**Y UNANIMOUS VOTE, members of the Health Officers Section of the North Carolina Health Association, in Winston-Salem, September 24, 1959, changed their name to the Health Directors Section, with the aim of shedding traditional association with the policeman's club. Modern public health practice, it was argued, thrives best under the glow of the educator's lamp.

As to the standing of health officials in the eyes of their associates, the medical societies, and the general public, however, there was no such unanimity. Members of a panel discussion on this subject disagreed pointedly as to the actual status of health officials, and the audience shared in an amiable controversy over steps which improve status.

With Dr. Arthur S. Chesson, Jr., health director of Wayne County, as chairman, the panel was composed of Dr. Edward G. McGavran, dean of the School of Public Health, University of North Carolina; Dr. M. B. Bethel, also with the school of public health, formerly health director at Charlotte; and Dr. R. D. Higgins, director of local health services for the North Carolina State Board of Health at Raleigh.

While admitting doubts that status can be objectively measured, Dr. McGavran suggested such indicators as the per capita budget for public health programs, expressed in uninflated dollars, relative to past budgets and to other current expenditures; the number and quality of applicants for positions in public health; and the extent to which the department holds or gains responsibility for community services. By such indicators, he said, the status of health officials has been on the downgrade. Per capita

budgets in constant dollars, relative to total national outlays, have been declining. Recruitment has been difficult, he said, although, at the same time, the shortage of personnel has failed to raise salaries as much as in other callings. And many community services associated with public health have been assumed by other departments of government.

Granting that "there is not a finer, more dedicated body as a whole than the public health profession," credited with achievements against great odds, he concluded nevertheless that still greater efforts were needed. While public health officials may enjoy high standing as individuals, he cautioned that the future status of the public health officer was precariously balanced.

To some extent, the dissent from this appraisal related to a definition of status or prestige. Applying the indicators used by Vance Packard as symbols of social status, Dr. Higgins ironically advised the audience to "be a supreme court justice or, as a second choice, a physician specialist; buy an expensive house in the best neighborhood away from the business section; drive a Cadillac or a foreign sports car; be gentle and Episcopalian; wear conservative clothes at work and sports clothes after work; buy clothes at the most expensive store in town and be casual about paying for them; arrive at work either earlier or later than other employees; and in your office have wall to wall carpeting, a private washroom, and an expense account that permits you to take your wife on business trips." By such standards, he observed, social status is appraised.

More seriously, he suggested that standing in the community depends on the amount of

(one)

Bladen Nebr.  
Sept. 21, 1959

Nebraska State Medical Association  
and Cooperating Organizations  
Dear Friends:

I just wasn't satisfied till I wrote you a few lines to let you all know that I certainly appreciated having an examination for Diabetes at the Nebraska State Fair, it was the first examination I ever had and I just thought it was all wonderful. Could not be any better. I been wanting to take an examination at your Fair for the last 3 years but I always got sick and fainted before I ever got started. But this year on Tuesday afternoon Sept. 8 I walked into your Hall

(Two)

of Health, wasn't even expecting on trying any more, but one nice little nurse came along and after she talked to me for about  $\frac{1}{2}$  hour she finally talked me into having the examination made, said she would take me through and guarantee I would not pass out, so I finally gave in to her. I just simply put all my confidence in her and let her be my guide. She took me through and it didn't seem to bother me one bit. I never thought it could be done

"it was all wonderful"

The letter above is a fair example of the personal appreciation which many feel for public health services. The appreciation of this writer, who confirmed his feeling with a cash contribution, was acknowledged both by the Nebraska State Medical

Society, to which it was addressed, and the Nebraska Department of Health, which cooperated in the exhibit of the Hall of Health. In evaluating health services, the number and character of such letters can be considered along with budget statements, tables of organization, and morbidity rates.

intelligence and knowledge which the job demands and which the jobholder applies. He advised that it is only proper that the jobholder be paid in proportion to the service: the pay is an indicator of the value of the service. Also the authority and responsibility in the job, as it exists in reality rather than on paper, is an indicator of the incumbent's standing. Further evidence of the individual's standing, he said, is seen in the ability to enter into

the circles of power in the community and to influence the decisions of such circles. Most important of all, however, he listed public knowledge and appreciation of the importance of the individual's achievements. Given the achievement, he indicated, the outer symbols of status, such as salary, power, and influence, depend on the extent to which the public understands what has been achieved.

Panel members agreed that efforts which im-

prove standing with the staff, the professional fraternity, or the general public all work in the same general direction, but each undertook to deal with these circles of responsibility separately. The health director's prestige with his own staff, said Dr. McGavran, depends to a considerable extent on actions which show a sincere, personal interest in staff members and their families. He said if an administrator puts concern with the staff first and the job second, staff morale will make the job more effective. He also said that it is only sound practice to help staff members to improve themselves and to gain better positions according to their abilities, rather than to try to hoard valuable personnel.

Equal status of all professions on the staff, rather than a pecking order, he proposed, is a major element in staff performance and prestige of health directors. It is the only way, he said, to get the best use of the best brains, and he advocated weekly, well-planned staff meetings as a means toward this end. As generally acknowledged top banana, he said, the medical officer is in a strategic position to encourage professional equality.

In line with this principle, he urged that administrators not attempt to direct performance in specialties outside their own. "The medical officer is responsible for what the staff does," he said, "not how it is done." Given such responsibility, he said, the staff will demonstrate its superior competence and the health director rises in everyone's estimation.

As to standing in the professional fraternity, Dr. Bethel urged public health officials to increase their communications with their confreres. "Visit, write, or call," he urged. Failure to be in touch, he said, means to lose touch. The mere presence at a meeting, the act of communication in itself, he said, is valuable.

Of even greater value, he said, is mastery of the information which a health official is expected to possess. Questions as to population, hospital and other health resources, morbidity and mortality rates, sanitary conditions and techniques, immunological status, and career opportunities which come chronically in the direction of the health officer should be met with

immediate and authoritative answers. "If you would grow in the eyes of your medical confreres," he told the assembled physicians, "know more than they can possibly know about your business, nor do you fail to show it. We have a utilitarian device in board certification, and it is a solemn duty . . . in the advancement of public health to attain this specialty status," he said. Above all, he said, consult with other professionals on public health programs. "Established doctors," he said, "can give you sound advice that will enable you to fight and slash your way out of many a crude entrapment, and at the same time they will think you a pretty smart fellow for asking their opinions."

At the same time, he cautioned public health officials against asserting knowledge in the provinces of other specialists. "They don't expect it of you and might even decry your shameless effrontery if you are provocatively knowledgeable in their fields, particularly if you are demonstrably deficient in your own."

All members of the panel agreed that it is essential to be alert to community health needs and to study these needs by utilizing the best intelligence available. They were unanimous also in their endorsement of continuing professional education, whether in formal courses, at professional meetings, or through literature, utilizing available consultants and in turn helping others to develop their own professional skills.

They were agreed that a concern with specific health needs of the community at large, so manifested that health services will be sought rather than peddled, is a distinguishing mark of the successful health department. "For example," said Dr. Higgins, "compare the program largely content with responsibility for communicable disease control with one which assumes responsibility for dealing with chronic ills, mental health, and urban growth."

The major ingredient of Dr. Higgins' prescription, however, was his emphasis that the public is an essential channel in the process of exchange of scientific information. "Carefully planned public relations and education," he said, "are needed if the knowledge gained and used is to be adequately supported."

## STATEMENT

*By Arthur S. Flemming, Secretary of Health,  
Education, and Welfare, November 9, 1959*

# Amphetamine Drugs

A CRACKDOWN by the Food and Drug Administration against the bootlegging of amphetamine drugs, the initial phase of which has just been completed, has disclosed a serious breakdown in our system of marketing controls for these drugs.

Concentrating initially on the bootlegging of amphetamine to truckdrivers, Food and Drug Administration inspectors obtained evidence that more than 200 operators of truck stops and similar establishments were selling the tablets.

In a number of instances, the inspectors also were able to learn where operators of the truck stops obtained the drugs, and as a result several wholesale peddlers of the tablets are under arrest and are being prosecuted by the Department of Justice.

Criminal proceedings also will be instituted against operators of the truck stops and other establishments found to be selling the drugs unless they are able to show cause why they should not be prosecuted.

In order to obtain this evidence, Food and Drug Administration inspectors have had to maintain various poses, often at considerable personal risk, in order to gain the confidence of truck stop operators, truckdrivers, and others associated with the sale of the tablets.

Agents of the Department of Justice who made the arrests found more than 800,000 amphetamine tablets in the hands of the wholesale peddlers, one of whom alone had 625,000 tablets in his house.

Commissioner of Food and Drugs George P. Larrick and his associates are convinced that the roundup of violators, successful as it was, has only scratched the surface of the total illicit traffic in amphetamine drugs.

The production of amphetamine last year

was about 75,000 pounds, enough to make about 3.5 billion amphetamine tablets, or about 20 tablets for every man, woman, and child in the United States.

Amphetamine is a central nervous system stimulant which taken under proper medical supervision has proved helpful, I am told, in selected cases of obesity, mental depression, and a number of other conditions.

It is when it is sold and used indiscriminately that the danger arises. When it becomes a bootleg product, this useful and powerful drug can readily become the accomplice not only of highway tragedy but of organized crime, juvenile delinquency, and quite possibly drug addiction.

According to medical experts in the Food and Drug Administration, amphetamine is much too potent a drug to be taken without medical supervision. For example, it may produce excessive nervous stimulation, loss of desire for sleep, impairment of judgment, hallucinations, and mental derangement. The amount of the drug required to produce these side effects varies widely from person to person. Under the Federal Food, Drug, and Cosmetic Act, it is illegal to dispense this drug without a doctor's prescription.

The prevention of desire for sleep is the basis for a large illegal trade in amphetamine among long-haul truckdrivers to enable them to stay awake beyond the limits of physical and mental endurance. While it is difficult to prove conclusively that any particular highway accident was due to the use of amphetamine by the driver, the drug has been found on drivers in a number of fatal highway traffic accidents, and there is other circumstantial evidence to implicate the drug in these accidents.

It is a well-established medical fact that prolonged wakefulness, beyond the fatigue limit, will result in a loss of muscular and mental coordination, impairment of judgment, and hallucinations. For example, a driver under the influence of the drug may see a mirage of an oncoming truck which may cause him to swerve off the road or into another vehicle which he didn't see.

Manufacturers, wholesalers, and retail drug-stores have a clear moral as well as legal responsibility to see to it that all dangerous drugs are kept in authorized channels leading ultimately to sale by a qualified pharmacist only on prescription.

In this connection, I should like to call particular attention to a decision rendered on September 30, 1959, by the U.S. Court of Appeals for the Fifth Circuit, in the case of Dr. Samuel J. DeFreese and Marsha Jean Simmons DeFreese versus United States. This case was on appeal from the U.S. District Court for the Middle District of Georgia. The defendants and appellants argued, among other things, that the wholesaling of amphetamine to a truck-driver was not "dispensing" within the meaning of the Federal Food, Drug, and Cosmetic Act. The court, I am happy to say, rejected this contention.

The Food and Drug Administration, with the excellent cooperation of the Departments of Justice and State and local police departments, is doing what it can to put a stop to the illegal

traffic in amphetamine drugs. This campaign will not only be continued but intensified in every way possible.

However, in view of the magnitude of the traffic in these drugs, I believe the present law does not provide the most effective way to get at the problem. We are therefore considering ways in which the legislative authority for dealing with this situation can be improved, and I expect that we will have a constructive proposal in this area to submit to the next session of Congress.

There are several ways in which existing law could be strengthened to improve the enforcement program. We are seriously considering such additional legislative requirements as the following:

1. That manufacturers, wholesalers, and retailers be registered to enable identification and that they be subject to Federal inspection.
2. That manufacturers, wholesalers, and retailers keep records of sales of the drug, with a penalty provision covering the falsification of such records.
3. A provision defining unauthorized possession of the drug as an offense.
4. A congressional action which finds that any illegal sale of the drug (whether or not the drug was in interstate commerce) is in effect a "burden" on legitimate interstate commerce, and hence subject to Federal control, thus making it unnecessary to prove interstate shipment in each bootleg sale.

### **Courses on Radionuclides in Food**

A course in radionuclides in food will be offered again during April 18-29, 1960, at the Robert A. Taft Sanitary Engineering Center, Public Health Service, Cincinnati, Ohio. Presented first in September 1959, the course is designed for persons responsible for monitoring radioactive materials in milk and food.

Subjects include methods for sampling and assay of radioactive contaminants, data interpretation, radiation fundamentals and instrumentation, and sources of radionuclides in foods.

Applications should be addressed to the Chief, Training Program, Robert A. Taft Sanitary Engineering Center, 4676 Columbia Parkway, Cincinnati 26, Ohio, or to the director of a Public Health Service regional office.

# Hospital Use in Massachusetts, 1945-1955

A. DANIEL RUBENSTEIN, M.D., M.P.H., HENRY R. MASON, M.P.H.,  
and ELIZABETH L. STASHIO

**D**ETAILED information concerning hospital use is urgently needed at a time when construction and operation costs of hospitals continue to rise. How has the shift of population in metropolitan areas from the core cities to suburbia influenced hospital utilization in medical teaching centers and institutions located in central areas? Why do some communities have higher rates of hospitalization than others? And, finally, are we prepared to develop criteria for determining reasonable or adequate levels of utilization?

To begin to answer these and related questions, a survey of hospital use in Massachusetts in 1955 was compared with a similar study undertaken 10 years previously when hospital service areas were first drawn up for the Federal hospital survey and construction program. Data on hospital admissions for the State's entire population residing in 351 cities and towns were gathered from the 163 general hospitals caring for acutely ill patients in 1945 and from the 149 such hospitals in 1955. All inpatient admissions with the exception of the newborn were counted. Data for the newborn were collected separately and were used to represent maternity admissions in these studies.

The grouping of cities and towns into 68 hospital service areas located in 6 regions of the State greatly facilitated the tabulation and analysis of hospital utilization data. Admissions to State and Federal military and veter-

ans hospitals and to long-term or chronic institutions were not included in these studies. Admissions for out-of-State residents were segregated from those for persons residing in Massachusetts. The community residence of all but 220 patients was available in the 1945 study, and of all but 833 patients, or less than one-tenth of 1 percent of all admissions, in the 1955 survey. Data concerning the community residence of maternity patients (as determined by the count of newborn) were also gathered for each of the 2 years.

## Pattern of Admissions

In the 10-year period 1945-55, total hospital admissions for Massachusetts residents per 1,000 population increased from 109 to 124. Although there were 14 fewer general hospitals in the later year, the total number of admissions (including maternity cases) increased 22.2 percent, and maternity admissions increased 3.1 percent. The State's population in this decade increased 7.7 percent. In 1945, maternity patients constituted 20.0 percent of all general hospital admissions; in 1955, they represented 17.01 percent of the total admissions.

The greatest percentage increase in admissions occurred in hospitals located in the rural and urban fringe communities. This was true of maternity cases as well as total admissions (see chart). In fact, the increase in maternity admissions in these areas was strikingly greater than the increase in either of the other two types of communities. General hospitals in the large urban communities—Boston, Cambridge, Worcester, and Springfield—experienced the smallest increase in total hospital

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*Dr. Rubenstein is director of the bureau of hospital facilities, Massachusetts Department of Public Health. Mr. Mason, now with the American Medical Association, was survey administrator, and Miss Stashio is senior statistical clerk with the bureau of hospital facilities.*

admissions. Their increase in maternity admissions exceeded that in the small urban communities, but was nevertheless much smaller than in the rural and fringe areas.

These findings reflect to a great extent the shifting of population from the large cities to the less densely populated areas of the State. Another factor has undoubtedly been the increase in number of suitable beds available in the rural and urban fringe areas. Almost half of the general hospital beds in these areas considered nonacceptable in 1945 because they were located in obsolete or inadequate buildings had been replaced with acceptable beds by 1955 (7).

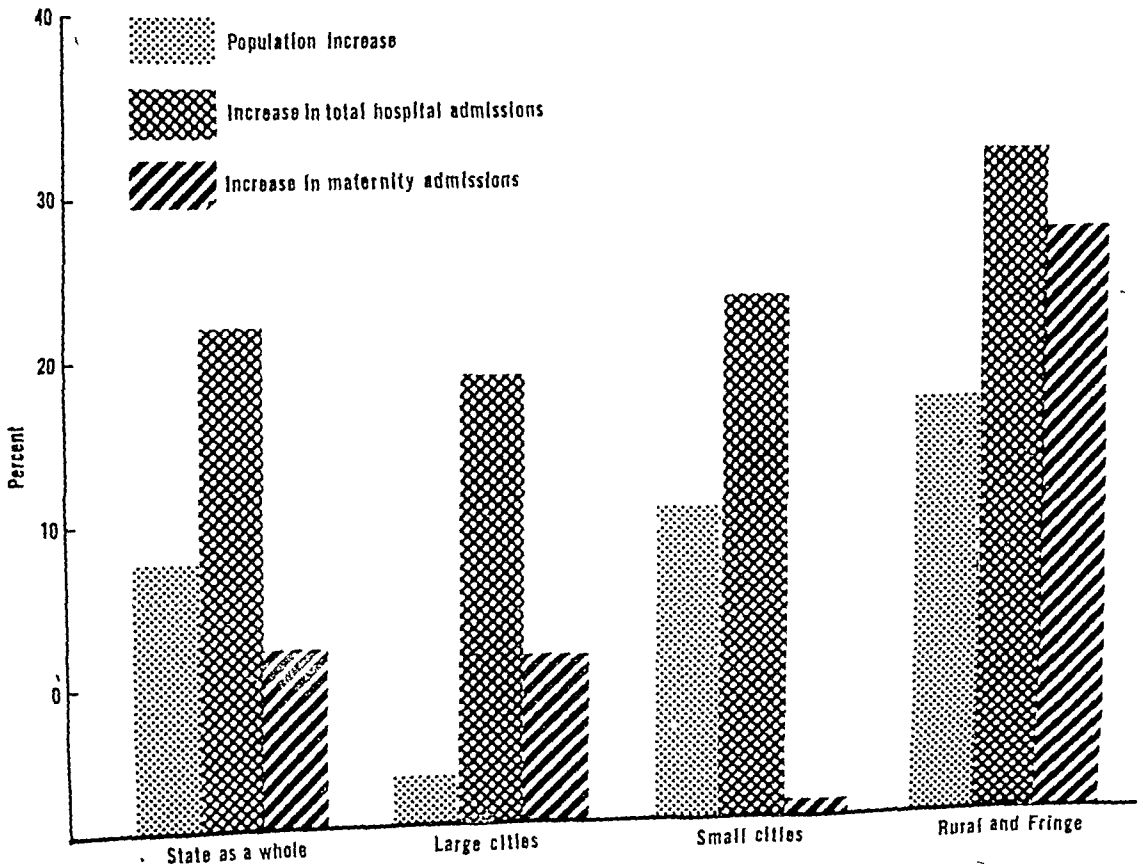
In comparison with the other two types of communities, the small urban areas did not experience an increase in general hospital admissions proportionate to their population growth. Also, their increase in maternity admissions was insignificant (0.2 percent).

These findings suggest that an increasing number of residents of the small urban areas are using the hospitals in the large urban medical centers.

Study of hospital admissions according to residence of patients revealed that the rate of hospital use was generally greater for residents of the large urban areas than for persons residing in the small cities or in the rural and fringe areas both in 1945 and 1946. For residents of the large urban areas, admissions rose from 119 per 1,000 residents in 1945 to 134 in 1955. In the small urban areas, the admission rate increased from 104 to 119, while in the fringe and rural areas the admission rate rose from 107 to 121.

Special attention was drawn to two large urban communities and one small urban community which showed unusual changes in rates of hospital admissions over the 10-year period.

**Percentage increase in population, total admissions to general hospitals, and maternity admissions, from 1945 to 1955, Massachusetts**



**Table 1. Relation of general hospital admissions to beds available in selected Massachusetts communities**

Communities	Hospital admissions per 1,000 population		Hospital beds per 1,000 population	
	1945	1955	1945	1955
Worcester-----	116	139	4.0	4.6
Springfield-----	121	118	3.7	3.2
Pittsfield-----	111	145	4.3	5.0
State as a whole--	109	124	3.8	3.9

In the Worcester metropolitan area, hospital admissions went from 116 to 139 per 1,000 population, while in the Springfield metropolitan area, only 50 miles from Worcester, the rate dropped from 121 in 1945 to 118 per 1,000 population in 1955 (table 1). In the smaller city of Pittsfield, general hospital admissions increased from 111 to 145. Examination of the ratios of hospital beds to population in these three communities revealed a possible influential factor in these changes. In 1945 Worcester had 4 general hospital beds per 1,000 population, and Springfield had 3.7 beds per 1,000. However, in 1955, Worcester's bed ratio rose to 4.6, while Springfield's dropped to 3.2 per 1,000. In Pittsfield, the hospital bed ratio rose slightly more than in Worcester, from 4.3 to 5.0 per 1,000 population. Such a positive correlation between utilization of general hospitals and the number of beds available has been observed recently by Shain and Roemer (2).

Study of the extent to which residents used hospitals in their own areas or in other areas revealed little change between 1945 and 1955 (table 2). There was, however, a small increase (1.6 percent) in use of rural hospitals by residents of rural and fringe areas and a similarly small increase (1.4 percent) in use of large urban hospitals by residents of small urban communities. There was also little change in the hospitals used by out-of-State residents, who accounted for 4.5 percent of all admissions to general hospitals in Massachusetts in 1945 and 4.2 percent in 1955.

Data on hospital use in Boston suggest that residents of the city who migrated elsewhere

in the State continued to use the city's general hospitals. In 1945 the population of Boston was 766,386, or 17.1 percent of the State's total. In 1955, the population was 41,684 smaller and constituted only 14.9 percent of the State's population. In the earlier year, 56.8 percent of the patients using Boston hospitals were residents of the city, whereas in the later year admissions of Boston residents diminished to 50.2 percent of the total patients admitted. Conversely, patients residing elsewhere in Massachusetts constituted 40.9 percent of the patient load in 1955, as compared with 34.5 percent in 1945. (The remainder of the patients in each year were out-of-State residents.)

### Summary and Discussion

Our studies thus far indicate that there has been a marked increase in use of general hospitals in Massachusetts between 1945 and 1955. In the State's four largest cities, hospital use increased substantially despite the fact that their aggregate population remained practically constant. The small cities and the rural and fringe communities experienced more marked increases along with relatively large population growth.

Hence, generally speaking, as the population has shifted from the cities to the less densely populated areas, hospital use has changed in the same direction. This relationship is true also of maternity admissions, at least in the rural and fringe areas. There are indications,

**Table 2. Percentage distribution of patients according to residence, by place of hospitalization, Massachusetts, 1945 and 1955**

Residence	Place of hospitalization					
	Large cities		Small cities		Rural and fringe areas	
	1945	1955	1945	1955	1945	1955
Large cities-----	91.5	91.7	7.2	6.7	1.3	1.6
Small cities-----	17.1	18.5	80.8	79.5	2.1	2.0
Rural and fringe areas--	19.5	19.5	17.9	17.9	61.0	62.6
Out-of-State-----	67.9	68.9	28.6	28.3	3.5	2.8



however, that an increasing number of inhabitants of small cities, some undoubtedly former residents of the large cities, are continuing to use facilities of the large teaching and medical center hospitals. While the small cities experienced a 10 percent population growth in the 10-year period, their hospitals showed only a 0.2 percent increase in maternity admissions.

These studies give substantial support to the thesis that the volume of admissions to hospitals in a community is directly related to the number of beds available in that community. It is apparent that hospitals located in the rural and urban fringe areas have been so well accepted by the public that the use of "population size" as the main criterion for measuring need for hospital beds has been validated.

Other variables, not considered in these

studies, have been suggested as factors also affecting hospital use. These include numbers and kinds of prepayment plans available, practice patterns of local physicians, and availability of outpatient services. Only after all such factors have been analyzed in relation to use of hospitals will it be possible to develop suitable criteria for determining adequate levels of hospital use and hospital bed needs in local communities.

#### REFERENCES

- (1) Massachusetts Department of Public Health: Massachusetts State plan for the administration of Public Law No. 725. Boston, 1956, p. 12, table 7.
- (2) Shain, M., and Roemer, M.: Hospital costs relate to the supply of beds. *Mod. Hosp.* 92: 71-73, 1958, April 1959.

## Rheumatic Fever Leaflet

#### HEALTH EDUCATION CASE HISTORY

Nine stages in the development of a leaflet on rheumatic fever recently published by a large industrial concern are described for *Public Health Reports* by a science writer who prepared it.

As a first step, it was agreed in consultation with the medical director's organization that an issue of the company's periodic health leaflet would be given to the topic of rheumatic fever.

Second, he read up on the subject in the latest medical books, in current medical periodicals, and in documents supplied by the American Heart Association.

Third, he attended as many meetings as he could where rheumatic fever was discussed.

Fourth, he showed a first draft and a layout of the proposed leaflet for comment to the American Heart Association, the local heart association, a medical consultant, and his wife.

Fifth, he incorporated the comments and criticisms received from these sources into a revised layout and text, which he submitted to the company for review and approval.

#### HEALTH EDUCATION CASE HISTORY

Sixth, changes suggested by the medical director's organization were made and the layout was approved by the company medical director.

Seventh, the text and layout were given to an artist, also engaged by the company, with suggestions for illustrations and colors as well as size specifications.

Eighth, the artist's layout and sketches were reviewed and okayed.

Ninth, all artwork copy was delivered to the company for printing and distribution.

This and similarly prepared leaflets on other health subjects of interest are distributed periodically to this company's employees throughout the United States. A survey has shown these leaflets to have popular appeal and acceptance by the employees. Requests for these leaflets come from students, teachers, nursing schools, health organizations, and others. A single request has called for as many as 300,000 copies. Since these leaflets are issued for employees rather than as a public service, they are supplied to the public only in limited quantities and then only when extra copies are available.

#### HEALTH EDUCATION CASE HISTORY

# Screening Relatives of Diabetics in Five Florida Counties

L. L. PARKS, M.D., M.P.H., QUENTIN R. REMEIN, LYDIA S. SHIELDS,  
and JAMES TURVAVILLE

**T**HAT DIABETES "runs" in families has been recognized for many generations, but this knowledge is seldom applied to community diabetes detection programs if one judges by the literature. Screening relatives of persons with diabetes is a continuing activity in Florida. This report describes the detection project in Hillsborough, Jefferson, Madison, Suwannee, and Taylor Counties during the period January through June 1958.

Programs for diabetics in Florida began in 1935 when a member of the State legislature for Polk County, who was a diabetic, presented a bill to provide funds to purchase insulin for the indigent diabetics in the State. The legislature has appropriated funds for this purpose, included in the State board of health budget, for every year except one when the item was not included in the budgetary request. The appropriation for 1959 was approximately \$40,000.

In 1946 the Public Health Service conducted a diabetes screening demonstration among the general population of Duval County, including Jacksonville. The Service also provided educational services, conducted classes for diabetics, and made other studies. Subsequently the

State board of health used a trailer that toured various counties to conduct diabetes screening among the general population. The trailer service was discontinued about 8 years ago because of lack of funds.

One of the studies related to the 1946 demonstration undertook to determine the prevalence of undetected diabetes among blood relatives of known diabetics in Duval County. The basis for the study was the long-observed, familial pattern of diabetes confirmed by numerous genetic studies. In the Duval County study (1) during the 3-year period from 1947 to 1950, 1,741 relatives of diabetics were given laboratory tests for diabetes, and 73 new cases of diabetes (4.2 percent of those tested) were discovered. The percentage of cases detected among relatives of diabetics was found to be about five times as high as the percentage found in screening general population groups.

After several years during which casefinding activities based on screening relatives of known diabetics were not feasible, the Florida State Board of Health undertook in 1957 to capitalize on the unique opportunity afforded by the State's purchases of free insulin for indigent diabetics. In 1957 approximately 2,700 diabetics received part or all of their insulin through the State board of health.

Casefinding among relatives has several advantages which were helpful in reactivating the diabetes detection program in Florida. Screening can begin with small groups of persons and yet have a sufficiently high rate of yield to make a small program productive.

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Such a program is adjusted easily to the staff and funds available merely by contacting greater or smaller numbers of diabetics for the names of their relatives.

The pattern of administration of the insulin purchase program is ideal for involving local health departments in diabetes casefinding.

The State board of health purchases the insulin and keeps the records; local health departments distribute the insulin and contact the diabetics.

The 1958 diabetes detection project to screen relatives of diabetics was designed on a small scale. Its supervisor was a fieldworker from the chronic disease division of the State board of health. Local health department clinics did the screening, State and local staffs jointly participated in the followup of relatives, and the State laboratory ran the tests. The Public Health Service cooperated by supplying funds to assist the program operation and by analyzing the data for the period January through June 1958.

These criteria governed the selection of participating counties: (a) the number of indigent diabetics residing in the county; (b) location of the county; (c) the county health officer's desire to participate in the program; and (d) approval of the program by the county medical society. Because of local health department needs and interests, rather flexible procedures were established and the details of methods differed among the various counties.

In general, when the several criteria for par-

**Table 1. Number of indigent diabetics, by age, race, and sex, five Florida counties, 1958**

Age group (years)	White		Nonwhite		Total
	Male	Female	Male	Female	
Under 15-----	0	2	0	0	2
15-24-----	1	2	1	2	6
25-34-----	1	1	1	4	7
35-44-----	1	8	0	8	17
45-54-----	7	18	2	12	39
55-64-----	11	39	5	20	75
65-74-----	17	35	4	14	70
75 and over-----	9	19	2	2	33
Not stated-----	1	8	0	3	14
Total-----	48	132	15	65	263

<sup>1</sup> Includes race or sex not stated.

**Table 2. Percentage of relatives tested by age group, five Florida counties, 1958**

Age group (years)	Number named	Number tested	Percent tested
Under 15-----	176	122	69.3
15-24-----	127	59	46.5
25-34-----	138	56	40.6
35-44-----	142	67	47.2
45-54-----	122	60	49.2
55-64-----	79	35	44.3
65-74-----	45	21	46.7
75 and over-----	13	6	46.2
Not stated-----	93	26	28.0
Total-----	935	452	48.3

ticipation had been met in a specific county, a mailing list was prepared from the roll of diabetics receiving free insulin. A letter of explanation and a questionnaire was sent to each diabetic asking him to give the names and local addresses of his blood relatives, including parents, children, grandparents, siblings, aunts, uncles, and first cousins. Postage prepaid return envelopes were enclosed with the questionnaire. If possible, a visit was made to try to locate and interview diabetics who failed to return their questionnaires.

A letter was prepared and sent to each relative with a local address named by the diabetic. The letter explained the purpose and the importance of a diabetes detection test, invited the relative to have a test at the health department at a specific appointment time, and asked that he notify the health department if the time were inconvenient so that another appointment could be arranged. It suggested that the relative, if he preferred, go to his family physician for the test. The letter also listed several menus, each containing approximately 100 mg. of carbohydrates, and stated that one of these meals should be eaten 2 hours before the appointment for the test. When they had time, health department staff members visited and offered a blood test to relatives who had not reported to the health department or gone to their family physicians for a test.

In the screening, blood sugar determinations were made by the Somogyi-Nelson method. A level of 130 mg./100 ml. of venous blood or higher was considered positive. For some very young children, urine specimens were exam-

ined by the Tes-tape method. Relatives who screened positive were advised to see their physician for further study and diagnosis. If they felt they could not afford a private physician, they were advised to contact the health department for further information. Those returning to the health department were then handled according to local regulations. The referral physician or clinic made the diagnosis.

## Results

During the 6-month period, 263 indigent diabetics in the five participating counties responded with information on their relatives. The distribution of the diabetics by age, race, and sex is shown in table 1. Their average age was 59 years. No effort was made to compare these respondents with diabetics from whom no information on relatives was elicited.

The diabetics identified 935 relatives, an average of 4 relatives per patient, and 452 relatives were tested. The percentage of relatives tested did not vary greatly by age except for a high response rate among children (table 2). In most screening programs in the general population the response rate in the older ages declines. It is possible that the direct, personal approach afforded by this casefinding method was responsible for the fact that the response rate did not fall off in the older age groups. Of course, the group was not large and other unknown, chance factors may have been operating in favor of this kind of response. Achieving

**Table 3. Percentage of relatives tested by relationship to diabetic patient, five Florida counties, 1958**

Relationship	Number named	Number tested	Percent tested
Father .....	13	7	53.8
Mother .....	28	17	60.7
Brother .....	83	25	30.1
Sister .....	121	57	47.1
Son .....	223	96	43.0
Daughter .....	291	155	53.3
Grandson .....	64	40	62.5
Granddaughter .....	61	41	67.2
Other blood relatives .....	51	14	27.5
Total .....	935	452	48.3

**Table 4. Test results among relatives by age, five Florida counties, 1958**

Age group (years)	Number of relatives tested	Number of diabetics found			
		Previously unknown		Previously known	
		Number	Rate per 1,000	Number	Rate per 1,000
Under 15 .....	122	0	-----	0	-----
15-24 .....	59	1	16.9	0	-----
25-34 .....	56	0	-----	0	-----
35-44 .....	67	1	14.9	0	-----
45-54 .....	60	1	16.7	0	-----
55-64 .....	35	3	85.7	2	57.1
65-74 .....	21	1	47.6	2	95.2
75 and over .....	6	2	333.3	0	-----
Not stated .....	26	1	38.5	0	-----
Total .....	452	10	22.1	4	8.8

among the aged a response approximating the average rate for the entire group is particularly significant for casefinding purposes in view of the high prevalence of diabetes in this age group.

Table 3 shows the percentage of relatives tested by relationship to the diabetics supplying information. The female relatives had a higher response rate in each instance than the corresponding male relatives. The highest response rate was found in grandchildren, followed by parents, children, and siblings, in that order. The first column also shows the distribution of the relatives named according to relationship. As might be expected from the age distribution of the diabetic patients, the relatives most frequently named were children, siblings, and grandchildren. There were relatively few parents and only two grandparents (not shown separately).

Table 4 indicates that the rate for previously known diabetics among the relatives is 8.8 per 1,000 persons tested, which is equal to the recent national prevalence estimate for previously known diabetes (2). This is also similar to the rate of 9.6 per 1,000 obtained in other Florida casefinding programs in recent years. The yield in previously unknown diabetes was 22.1 per 1,000 persons tested. This is more than 2½ times the national estimated prevalence rate of

8.1 unsuspected cases of diabetes per 1,000 population and more than three times the yield of previously undiscovered cases in the average program reported to the Chronic Disease Branch, Public Health Service. In 64 screening projects with diagnostic information reported, the average program found 6 previously unknown diabetics per 1,000 tested.

Results by age among the relatives of diabetics follow a pattern similar to that in general population screening. The rate of diabetes discovered increases with age. Making use of this phenomenon could greatly increase the yield per person tested. If children under 15 years of age had been excluded, the yield would have been 30.3 previously unknown cases per 1,000 tested. If relatives under 35 years of age had been excluded, a yield of 41.9 per 1,000 tested would have resulted. This latter rate is over three times the rate of previously unknown cases found in screening adults in the general population in Florida. During the period September 1955 through January 1957, seven diabetes screening programs were conducted in the State among persons 30 years of age or over. In screening over 16,000 persons, a rate of 12.9 previously unknown diabetes cases per 1,000 tested was obtained.

All diabetes cases were found among the parents, children, and siblings of diabetic patients

**Table 5. Test results among relatives by relationship to diabetic patient, five Florida counties, 1958**

Relationship	Number of relatives tested	Number of diabetics found			
		Previously unknown		Previously known	
		Number	Rate per 1,000	Number	Rate per 1,000
Father.....	7	1	142.9	0	-----
Mother.....	17	3	176.5	0	-----
Brother.....	25	0	-----	1	40.0
Sister.....	57	2	35.1	3	52.6
Son.....	96	1	10.4	0	-----
Daughter.....	155	3	19.4	0	-----
Other blood relatives.....	95	0	-----	0	-----
Total....	452	10	22.1	4	8.8

**Table 6. Ratio of diabetic relatives per 100 diabetic patients responding to the program, by age of diabetic patient, five Florida counties, 1958**

Age of patient (years)	Number of patients	Diabetic relatives			
		Previously unknown		Previously known	
		Number	Ratio per 100 patients	Number	Ratio per 100 patients
Under 35.....	15	0	-----	0	-----
35-44.....	17	2	11.8	0	-----
45-54.....	39	1	2.6	0	-----
55-64.....	75	2	2.7	2	2.7
65-74.....	70	5	7.1	2	2.9
75 and over.....	33	0	-----	0	-----

(table 5). These groups comprised the largest fraction of the relatives named.

Most of the diabetics were discovered among the relatives of patients who were 55 years of age and over (table 6). Patients under 35 years of age named no relatives who were found to be diabetics.

The results in finding previously unknown

**Table 7. Comparison of the rates of previously unknown cases of diabetes among relatives of diabetics in Duval County, Fla., study 1947-50, and five Florida counties, 1958**

Age group (years)	Duval County, Fla., study		Five Florida counties	
	Number tested	Rate of previously unknown diabetes per 1,000 tested	Number tested	Rate of previously unknown diabetes per 1,000 tested
Under 15.....	316	( <sup>1</sup> )	122	( <sup>1</sup> )
15-24.....	277	3.6	59	16.9
25-34.....	366	21.9	56	( <sup>1</sup> )
35-44.....	342	52.6	67	14.9
45-54.....	201	89.6	60	16.7
55-64.....	154	116.9	35	85.7
65 and over.....	77	129.9	27	111.1
Not stated.....	8	( <sup>1</sup> )	26	38.5
All ages.....	1,741	41.9	452	22.1

<sup>1</sup> No cases found.

diabetes cases in this study are not as great as those obtained in the Duval County study (1). The rates by age group in both studies are compared in table 7. No cases of diabetes among relatives under 15 years of age were found in either study. The greatest difference was in the age bracket 35-54 years in which the five-county project had a much lower yield. The factors accounting for these differences are not known.

## Discussion

Screening relatives of diabetics has proved to be a practical method of finding cases of diabetes in Florida. Through a unique program of insulin distribution, indigent diabetics can be reached readily. Elsewhere, various ways can be used to develop similar programs. The relatively large diabetes clinics of most general hospitals and outpatient departments provide excellent sources from which to obtain a diabetic population. In some areas it may be possible to secure names of diabetics from local physicians cooperating in casefinding. Diabetics could be reached with informational materials through their physicians or pharmacists and invited to participate by referring relatives for testing. In general community casefinding programs all persons found to have diabetes should be interviewed to obtain information on relatives who could be offered a blood screening test.

In planning diabetes programs, we would reiterate suggestions often made but infrequently heeded, suggestions whose worth has been borne out again by experience in this project. Concerted education and information efforts greatly reduce misunderstandings and problems and improve participation all along the line. Personal interview or personal followup after distributing the initial questionnaire increases

participation by diabetic patients. Likewise, personal fieldwork improves the response rate of the relatives and their followthrough to diagnosis when indicated. Since a number of relatives were not screened because of working hours, some evening clinics seem to be highly desirable to improve response. Costs have not been studied in this project, but it is clear that a somewhat greater investment to insure a high response rate is warranted when the yield in previously undetected cases is high.

As previously indicated, the yield rate can be significantly increased by not testing persons under 15 years of age. Of course, this rule need not be followed strictly if it reduces rapport with diabetic patients and their relatives. It also may be desirable to test only grandparents, parents, siblings, children, and grandchildren if it is necessary to limit the program.

## Summary

A total of 263 indigent diabetics in five counties of Florida named 935 relatives, of whom 452, or 48.3 percent, were tested for diabetes. The rate of previously known diabetes was 8.8 per 1,000 tested and the yield of previously unknown cases of diabetes was 22.1 per 1,000 tested. This yield is more than three times the usual yield in diabetes screening programs in general population groups. While the number of diabetics found was small, the results support previous findings that this is a practical casefinding method with a high rate of yield.

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# Sanitary Engineering Degrees Awarded in 1958

Institution	Doc- tor's	Mas- ter's	Bache- lor's	Institution	Doc- tor's	Mas- ter's	Bache- lor's
Alabama Polytechnic In- stitute.....		0	10	New York University.....	0	3	2
Alabama, University of.....		0	0	North Carolina State Col- lege.....	0	2	
Arkansas, University of.....		2		North Carolina, Univer- sity of.....		6	
Brooklyn, Polytechnic In- stitute of.....		0		North Dakota, Univer- sity of.....		1	
California Institute of Technology.....	1	3	1	Northeastern University.....	0	0	0
California, University of.....	1	13	2	Northwestern Technologi- cal Institute.....	12	15	
Case Institute of Technol- ogy.....	0	0	0	Ohio State University.....	0	2	2
Cincinnati, University of.....		0	3	Oklahoma Agricultural and Mechanical College.....	0	0	4
Colorado, University of.....		0	0	Oklahoma, University of.....	0	14	0
Connecticut, University of.....		0		Oregon State College.....	(2)	(2)	
Cornell University.....	1	1	1	Pennsylvania State Uni- versity.....	0	0	1
Florida, University of.....	1	2	7	Puerto Rico Agricultural and Mechanical College.....			0
Georgia Institute of Tech- nology.....	0	0	7	Purdue University.....	0	4	3
Harvard University.....	3	17	1	Rensselaer Polytechnic Institute.....		0	3
Idaho, University of.....		0	0	Rice Institute.....		0	
Illinois Institute of Tech- nology.....	0	0	2	Rutgers University.....	1	14	1
Illinois, University of.....	0	0	3	South Dakota State Col- lege.....		0	2
Iowa State College.....	0	1	9	Southern California, Uni- versity of.....		2	
Iowa, State University of.....	12	0		Southern Methodist Uni- versity.....		1	
Johns Hopkins Univer- sity.....	1	16	13	Syracuse University.....	0	0	0
Kansas, University of.....		2	0	Tennessee, University of.....		1	
Kentucky, University of.....	0	0	0	Texas, Agricultural and Mechanical College of.....	0	12	
Maine, University of.....		1	3	Texas Technological Col- lege.....		(2)	(2) 12
Marquette University.....			25	Texas, University of.....	0	2	
Maryland, University of.....		0	0	Tulane University of Lou- isiana.....		0	1
Massachusetts Institute of Technology.....	1	11		Utah, University of.....	0	0	
Massachusetts, University of.....	0	0	0	Virginia Polytechnic In- stitute.....	0	2	8
Michigan College of Min- ing and Technology.....		0	12	Washington, State College of.....	0	1	1
Michigan State College.....	1	1		Washington University.....		(2)	
Michigan, University of.....	0	14	3	Washington, University of.....	0	3	0
Minnesota, University of.....	0	13	1	West Virginia University.....		(3)	(2) 15
Mississippi State College.....		(2)	(2)	Wisconsin, University of.....	1	12	
Missouri School of Mines and Metallurgy.....		1	5				
Missouri, University of.....		(2)	(2)				
Nebraska, University of.....		0					
Newark College of Engi- neering.....		2	12				
New Hampshire, Univer- sity of.....		(2)					
New Mexico College of Agriculture and Me- chanical Arts.....		1	3				
				Total.....	16	128	148

<sup>1</sup> Includes foreign nationals. <sup>2</sup> Data not available from these schools for 1958.

NOTE: Leaders (.....) indicate no specialization offered at this level.

During the period from July 1957 through June 1958, 142 graduate degrees in sanitary engineering were conferred by institutions in the United States: 128 master's degrees and 16 doctor's degrees. During the same period, 148

students completed undergraduate programs specializing in sanitary engineering.

The table above shows the awarding institutions and the number and level of degrees which these institutions reported as conferred,

# Engineering degrees awarded annually, by type of degree, 1951-58

Year	Number sanitary engineering degrees	Schools awarding sanitary engineering degrees	Schools offering sanitary engineering curriculums	Total number engineering degrees <sup>1</sup>	Number sanitary engineers per 1,000 engineering degrees
Bachelor's degrees					
1958.....	148	33	45	35,332	4.2
1957.....	145	31	43	27,748	5.2
1956.....	208	32	53	23,547	8.8
1955.....	141	32	44	20,200	7.0
1954.....	164	32	40	19,707	8.3
1953.....	216	36	41	21,642	10.0
1952.....	216	36	41	27,155	8.0
1951.....	244	35	39	37,904	6.4
Master's degrees					
1958.....	128 (29)	35	61	5,788	22.1
1957.....	152 (39)	41	64	5,203	29.2
1956.....	124 (31)	33	67	4,678	26.5
1955.....	134 (34)	33	53	4,444	30.2
1954.....	120 (25)	30	56	4,130	29.1
1953.....	102 (20)	25	57	3,726	27.4
1952.....	105 (22)	29	57	4,132	25.4
1951.....	152	26	57	5,134	29.6
Doctor's degrees					
1958.....	16 (4)	12	36	647	24.7
1957.....	11 (1)	6	32	596	18.5
1956.....	9 (1)	7	27	610	14.8
1955.....	11 (2)	4	28	599	18.4
1954.....	9	5	26	590	15.3
1953.....	5	4	24	592	8.4
1952.....	9	5	23	586	15.4
1951.....	7	4	25	586	11.9

<sup>1</sup> See Armsby, H. H., and Lewis, J. C.: Engineering enrollments and degrees in ECPD-accredited institutions: 1959. Journal of Engineering Education 49: 482-498, Feb. 15, 1959.

NOTE: Figures in parentheses represent nationals of other countries included in larger figure.

irrespective of the nomenclature of the degree. A list of all schools offering such training is available from the authors. Similar data for the period since 1889 appear in the literature (1-4) or have been distributed by the Public Health Service.

Comparative data on the conferment of

*Prepared by Frederick K. Erickson, S.M., and Frank A. Butrico, M.S.S.E., Office of Engineering Resources, Division of Engineering Services, Public Health Service. Mr. Erickson is sanitary engineer director, and Mr. Butrico, chief of the office.*

degrees for the years 1951-58 are given in the tabulation above.

## Undergraduate Degrees

Forty-five institutions offered undergraduate electives in sanitary engineering during the academic year 1957-58. Thirty-three of these schools reported that 148 graduates had received undergraduate training toward the bachelor's degree in sanitary engineering or had a sanitary engineering major or option. Undergraduate emphasis on sanitary engineer-



ing continues to show a downward trend. The average number of graduates per year for the 10-year period 1948-57 was 202, and for the 5-year period 1953-57, 175.

### Master's Degrees

Thirty-five of the 68 schools offering graduate training for the master's degree in sanitary engineering awarded 128 degrees, 29 of them to foreign nationals. The remaining 31 schools (45 percent) reported no graduates.

Eleven schools had 4 or more graduates and accounted for 87 of the total number of degrees conferred at this level. Of these 11 schools, 6 have averaged over 5 master's degrees per year for the 10 years 1949-58. The average number of master's degrees conferred per year for the 10-year period 1948-57 was 134, and for the 5-year period 1953-57, 126.

### Doctor's Degrees

In 1958, 12 institutions awarded a total of 16 doctor's degrees in sanitary engineering, 4 of

them to foreign nationals. Twenty-five other schools offered a sanitary engineering program at the doctorate level, but reported no awards of degrees.

Three of the 12 schools have awarded 1 or more doctor's degrees each year for the past 5 years and have accounted for over 55 percent of the doctorates in sanitary engineering over that same period. For the 10-year period 1948-57, the average number of doctor's degrees per year was 7.3, and the average for the 5-year period 1953-57 was 9 degrees.

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## Exhibit on PHS Contributions to Medical Research

An exhibit on some of the contributions of the Public Health Service to medical research during the period 1900-1940 was held in the Service's National Library of Medicine from September through November 1959.

Selected papers, books, some in foreign languages, reports, memorabilia, and photographs demonstrated the work of a number of Public Health Service scientists who were associated largely with the Hygienic Laboratory and the National Institutes of Health. Their activities advanced knowledge of such diseases as hookworm disease, tularemia, pellagra, plague, Rocky Mountain spotted fever, encephalitis, psittacosis, and typhoid and typhus fevers. Contributions were also in chemistry and pharmacology—hydrogen ion determination, discovery of the thyroid hormone in the blood, and antineuritic vitamins.

Scientists represented in the exhibit were Dr. Milton Rosenau, Dr. John F. Anderson, Dr. George W. McCoy, Dr. R. E. Dyer, Dr. Edward Francis, Dr. James P. Leake, Dr. Charles Armstrong, Dr. Wade H. Frost, and Dr. William Wherry. Chemists, pharmacists, and zoologists were Reid Hunt, Atherton Seidell, Maurice I. Smith, William Mansfield Clark, and C. W. Stiles.

## STATEMENT

*By Arthur H. Wolff, D.V.M., Division of Radiological Health, Public Health Service, before the Special Subcommittee on Radiation of the Joint Congressional Committee on Atomic Energy, May 6, 1959*

# Fallout and Uptake of Iodine-131

In considering the uptake mechanism for fallout, almost exclusive attention has been given to strontium-90. Strontium-90 as an environmental contaminant certainly deserves primary attention because the problem will persist for years following the cessation of nuclear weapons testing. Even though strontium-90 is the nuclide of major significance, the potential hazard of some of the shorter-lived nuclides should not be overlooked. Some of the other fission-product radionuclides are not necessarily insignificant just because they are short lived; they may present a contamination problem if they are sustained in the biosphere at relatively high levels.

Of particular importance in this regard is iodine-131, a fission-product radionuclide with a half-life of approximately 8 days. Iodine-131 is unique among the fission-produced radionuclides in that it concentrates in a small gland, the thyroid. Consequently, extremely small amounts of the nuclide taken into the animal body will result in relatively high dosages to a single gland as compared with equal amounts of other radionuclides more widely distributed in the body.

As a result of its 8-day half-life the concentration of iodine-131 in a gross fission-product mixture gradually diminishes, and the amount of iodine-131 reaches negligible proportions several weeks to months following its creation. It is likely, therefore, that any iodine-131 in the biosphere results primarily from rather fresh fallout.

Several investigators have measured the iodine-131 levels in the thyroid glands of grazing animals as an index of fresh fallout in various parts of the world. Much of the work in this

field has been done by Dr. Lester van Middlesworth, University of Tennessee, Memphis. Since 1954 he has collected thyroid glands from animals in slaughterhouses from various countries and particularly from Tennessee in this country. From 1955 to 1958, based on his data the average concentrations of iodine-131 sustained in U.S. cattle and sheep were in the order of 700 and 3,000 micromicrocuries per gram of thyroid respectively. The average weekly dose was about 60 millirad per week for cattle and 250 millirad per week for sheep. These concentrations are average values; considerable fluctuations occurred according to the type and location of weapons testing in progress just prior to the time of collection. Other investigators (1-4) have found similar levels in other parts of the United States.

It is apparent that despite its short half-life iodine-131 has been readily detectable as a biospheric contaminant reflecting current weapons tests. The levels found are quite likely innocuous insofar as the health of the animals is concerned. However, iodine-131 as a biospheric contaminant probably has resulted in a higher dosage level to any given volume of tissue than has any other fission-product nuclide.

The levels of iodine-131 in grazing animals are considerably higher than any levels concurrently found in humans because grazing animals consume large quantities of foliage upon which fallout and rainout are directly deposited.

The values in cattle are of particular interest because, theoretically, we should also expect detectable quantities of iodine-131 to be secreted into the milk. The Public Health Service has therefore included iodine-131 as well as certain other short-lived radionuclides in its milk sur-

**Average iodine-131 concentrations in milk based  
on monthly sampling**

Milkshed	June 1957- April 1958 ( $\mu\text{mc./l.}$ )	May 1958- January 1959 ( $\mu\text{mc./l.}$ )
Atlanta, Ga. <sup>1</sup>		22
Austin, Tex. <sup>1</sup>		39
Chicago, Ill. <sup>2</sup>		38
Cincinnati, Ohio	136	41
Fargo, N. Dak. <sup>1</sup>		38
New York, N.Y.	79	31
Sacramento, Calif.	30	40
St. Louis, Mo.	258	99
Salt Lake City, Utah	249	33
Spokane, Wash. <sup>3</sup>		32

<sup>1</sup> First sample June 1958.

<sup>2</sup> First sample July 1958.

<sup>3</sup> First sample August 1958.

veillance program. The average iodine-131 levels detected in milk from various sampling stations are shown in the table.

Dr. E. B. Lewis, California Institute of Technology, has submitted a statement for the record which estimates the human dosages and possible biological significance that would be associated with consumption of milk containing the levels of iodine-131 reported here.

Iodine-131 levels in cattle thyroid may provide a presumptive index of the levels secreted

into milk in the same area. This is one parameter which the Public Health Service hopes to investigate in its future work in radiation surveillance of the environment.

The technique for measuring iodine-131 levels in thyroid glands is relatively simple. Perhaps greater reliance should be given to this technique, for it may serve not only as an early and sensitive index of the biological incorporation of iodine-131 but also may provide an index of the biological accumulation of other fission products. Iodine-131 as an index of environmental contamination, however, is only applicable to fission products of recent origin.

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## Residence Requirements and Federal Aid

Both the Federal Government and our State governments must come to grips with some basic issues in connection with the administration of our Federal-State programs of public assistance. . . .

To the extent that funds are utilized for public assistance purposes, there should be no residence requirement by the States. The Federal Government is making funds available in order that persons who are in need may receive assistance. It has no concern and should not have any concern about how long persons have lived in a particular community or State. In fact, I feel that it is indefensible for the Federal Government to continue to permit the restriction of the use of its funds in this manner.—ARTHUR S. FLEMING, *Secretary of Health, Education, and Welfare, at the Governors' Conference, San Juan, Puerto Rico, August 4, 1959.*

# Reinforcement of Family Ties

GERALDINE GOURLEY

**D**URING the past several years, there has been increasing concern about an apparent weakening of the family as a strong, effectively functioning entity. This concern is shared by other countries across the world, where industrialization and other "benefits" of Western culture are accompanied by a breakdown in family life.

There have been many attempts to explain the reasons for this situation which we will not try to explore, but it does behoove each of us who has a responsibility for working with families to ask whether our efforts contribute to or threaten any aspect of family security and strength.

The importance of the family, both as a social force and as the basis for healthy personality development, is consistently stressed. We have swung from rigid routines in baby care to self-demand feeding, from early toilet training to self-discipline, and have made many changes in our ideas of what is "good for people." But at least intellectual acceptance of the value of the family has remained constant. Emphasis is, in general, on the primary family with some recognition that it does not exist in a vacuum, but is a member of a community. There is less expressed recognition that this family is also a member of a family, and of a social group from which it derives its identity.

Relationships inherent in the extended family have almost disappeared from segments of

our population. In certain groups these broad family ties still exist and are important. And, for those of us who may have lost these close ties, there is often a sense that here we may have lost something of value. How often have we heard our mobile friends say wistfully that "the family is so separated," a note of regret that there is, for their children, so little sense of family that reaches beyond the typical American home? One of the plausible explanations of the cause of weakened family effectiveness is the lack of roots in broader family relationships. What additional strains are placed on parents where support from and close identification with their own families are missing? What is lacking for a child who does not feel a close part of a family which reaches beyond his own household? If we can concede that these are important relationships to conserve and strengthen, we must consider the part we play in strengthening or threatening these ties and, thereby, in affecting the ability of the family to meet its obligations successfully.

## The Figure of Authority

Studies have been made to evaluate the secondary effects of health programs which substitute professional authority for the traditional teaching by older family members, experienced neighbors, or other key persons in the social group. It seems safe to speculate that these changes in authority figures are not without significance. And we might further speculate that, when these persons are divested of authority and respect in such vital fields as family health and child rearing, this may carry over into other areas of relationship. Can members of the family or social group, whose ideas on

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*Miss Gourley is a medical social consultant in the child development center of the New Mexico Department of Public Health in Santa Fe. The paper was presented at the 17th annual meeting of the United States-Mexico Border Public Health Association in Brownsville, Tex., April 1959.*

these matters have been labeled "wrong," "misinformed," even "bad," be expected to retain respectful consideration for their attempts to support social values basic to family functioning within the specific culture?

No one of us who has worked in public health questions that there are health practices which we must attempt to change. This is a large part of our reason for being. But we may need to weigh the actual health implications of some ill-favored practices against the possibility of strained relationships within the family or social group.

In the past few years we have become imbued with the importance of "culture." We find extensive material in health journals stressing the need for knowledge about and respect for the cultural background, beliefs, and customs of any group affected by health programs.

Culture is, of course, not the exclusive property of these groups sometimes described as "backward" and "interesting." As health workers we have a definitely ascribed culture which influences our own attitudes and behavior. Practices of child care, family management, medical care, and general patterns of family living which differ from the accepted theories and practices of the culture to which we belong, or aspire, may be labeled as "wrong," "misinformed," or, even worse, as "quaint" and "amusing" and therefore not to be considered seriously.

With our "scientifically oriented" beliefs about what contributes to or threatens health, there is a strong temptation for professional workers to have a sense of the rightness of our authority. After all, don't we represent a way of life which produces statistics showing significant decreases in morbidity and mortality, better teeth, and children who can tip the scales at a higher level? This very assurance of authority has contributed to parents having a tendency to become dependent on professional workers. If the professional worker feels that his role entitles him to this authority and derives satisfaction from having people depend on him for advice and help, he may voluntarily or involuntarily develop willing and compliant followers. But the professional worker cannot and would not be willing to fulfill the role of those persons who may be estranged by this

transfer of dependency, nor can he satisfy the emotional needs which can only be met within the family or social group.

Any attempt to bring about changes which may result in friction, resentment, or lessened sense of value to any important family member, or threaten the parents' position in the social group with which he is identified, should be made only with full knowledge of possible consequences. When, after such a careful evaluation, we feel convinced that change is important for the welfare of the family, we must make as earnest an effort to handle possible family tensions as we make to alter the health practice itself. Pressure for change tends to produce strain, since it implies criticism of previous methods. We can partially balance this strain by consciously reinforcing those things in the culture which are important and which provide stability.

To deprive the older family member of her authority on what constitutes proper feeding of the family and the appropriate way to treat a child's illness, and still show respect for her role, is not easy. It can be done convincingly only if we have real conviction of her importance. The effect of a tolerant but condescending smile, the summary dismissal of a family health practice or social custom, may have more disrupting effect on family relationships than we realize; on the other hand, the genuine respect of a professional worker for the authority figures in a social group may give them much-needed support in fulfilling their roles and contributing to family strengths.

In a number of instances, programs reflect an attempt to avoid or mitigate the threat to family and group solidarity from situations produced by change. Classes for expectant mothers, for example, have included expectant fathers and grandmothers, as well as other group members who represent authority. This would seem to be worth while since there is no time in a young woman's life when she is more in need of family acceptance and support. It is also a most important event for the total family.

An important consideration in the success of such an experiment is the purpose and method of including these additional persons. How are these family "authorities" viewed by the pro-

professional worker? Are they expected to sit as listeners while we attempt to impart our health culture? Or are they encouraged to participate as recognized and respected authorities, with every possible support given their ideas even though some of them may have little scientific basis according to our present knowledge?

I use the term "present knowledge" advisedly. Some of us remember the days when we, with complete professional sincerity, contributed to making grandmother a dangerous character to be watched or she might rock the baby or slip him a between-feeding snack. Many a child was saved from the rigid schedule only because grandma knew too much to go along with the "education" of that day. And at how many foods and home remedies have we looked down our professional noses, only to go back to encouraging their use at a later date? Even when we can feel reasonably certain that a custom has no scientific health value, this does not mean that it holds no social value for the members of the group. Unless the practice is actually harmful, it can at least be given respectful consideration. Many a skillful nurse encourages the expectant mother to follow her own mother's advice regarding the *muneco*, or cloth band, around her waist to keep the fetus in place, at the same time that she attempts to influence her diet and general prenatal care. And at some of the hospitals caring for our southwest Indians, highly skilled physicians have realized the value of inviting medicine men to participate in the treatment of certain patients.

With all our best efforts to gain social group support for a family, there will be times when we have to encourage a parent to take a stand which we know may produce conflict. In these instances, we can at least attempt to develop sympathetic understanding of the feelings which may be aroused and lend our help so that the situation can be handled with minimum guilt and resentment. We must be as much concerned with helping parents maintain the best relationships possible as in supporting them to remain firm about a controversial family issue. Identification with a young mother against her unreasonable relatives or neighbors will serve no purpose. An attitude of "I am on your side; pay no attention to those misin-

formed and misguided advisers" will not be of lasting help. She will need these relationships long after we have moved out of the picture.

When changes may bring conflict between husband and wife, we need to take an even longer look at the advisability of supporting such recommendations. It may be of questionable value to have a child with good teeth and strong muscles, who is fed, toileted, and disciplined according to the latest theories, if friction between parents prevents family unity necessary for healthy emotional development.

### Family Cohesion

Probably the most critical events in the life of any family, those experiences which have throughout time drawn families closest together, are childbirth and illness. The development of modern facilities is removing both of these from the home and away from the family.

Many of us have probably been in some way connected with a home delivery. This was certainly a family affair, with relatives and neighbors participating, and father and children waiting for a signal to claim the mother and new baby. The contrast with delivery in some of our hospitals has caused many thoughtful persons to question what may be the effect on family life and on the ultimate welfare of mother and child. In some of our hospitals we have come through the period when, for reasons of obsession with sterility or hospital routine, the mother disappeared into the mysterious recesses of the hospital, not to reappear again until it was "all over." The baby was immediately relegated to a separate nursery, scarcely to be seen thereafter except through a glass wall. The only visitor permitted on the ward was the father, and he was often so awed by the professional atmosphere that he sat out his visiting hour, stiff and uncomfortable, not daring to touch the baby which had been made so formidable by sterile precautions.

I will not be so heretical as to suggest that the figures presented to show increases in hospital deliveries may not always indicate unmitigated blessings. But certainly we can question hospital policies which preclude family participation. Some of our leading physicians and hospital administrators are successfully taking steps to

these matters have been labeled "wrong," "misinformed," even "bad," be expected to retain respectful consideration for their attempts to support social values basic to family functioning within the specific culture?

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To deprive the older family member of her authority on what constitutes proper feeding of the family and the appropriate way to treat a child's illness, and still show respect for her role, is not easy. It can be done convincingly only if we have real conviction of her importance. The effect of a tolerant but condescending smile, the summary dismissal of a family health practice or social custom, may have more disrupting effect on family relationships than we realize; on the other hand, the genuine respect of a professional worker for the authority figures in a social group may give them much-needed support in fulfilling their roles and contributing to family strengths.

In a number of instances, programs reflect an attempt to avoid or mitigate the threat to family and group solidarity from situations produced by change. Classes for expectant mothers, for example, have included expectant fathers and grandmothers, as well as other group members who represent authority. This would seem to be worth while since there is no time in a young woman's life when she is more in need of family acceptance and support. It is also a most important event for the total family.

An important consideration in the success of such an experiment is the purpose and method of including these additional persons. How are these family "authorities" viewed by the pro-

# Anticipating Safety and Health Needs

HAROLD J. MAGNUSON, M.D.

**F**ORESEEABLE changes affecting occupational health and safety needs may be considered as occurring in three areas: industrial technology, medical technology, and sociological change produced by a multiplicity of economic forces.

## Technological Change in Industry

In the area of technological change, the event of greatest moment, perhaps, has been the onset of the electronic and nuclear energy age. New possibilities have opened up for the entire electromagnetic spectrum, ranging from the infrared waves to cosmic rays. We shall see an increasing use of manmade radiation not only as a source of power but also as a tool in the study of industrial processes and methods and in the control of product quality. Many predict that the peaceful use of nuclear energy will be a major influence in our civilization by 1980.

As one illustration, the microwave region has opened up broad new areas of research in many fields, with potential application to industry. Microwaves already are finding increased use in spectroscopy, radio astronomy, particle accelerators, radar, communications, and food sterilization. But, as is true of many other rapid developments, knowledge of the health effects of microwaves has not kept pace with their use.

Another technological development which has aroused considerable interest is automation.

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*Dr. Magnuson serves as chief of the Occupational Health Branch of the Public Health Service. The paper was read at the 1959 convention of the International Association of Governmental Labor Officials, which was held in Kennebunkport, Maine, September 9-12, 1959.*

By no means new, automation has appeared in various guises, such as in automatic poison gas alarms and driverless lift trucks. Automation makes possible new products, processes, and production volumes, leading ultimately, as some expect, to larger work forces. Various industries, such as those engaged in the production of new synthetic fibers, antibiotics, and nuclear energy, critically depend on automatic controls for volume production and worker safety. That automation will find its way into more uses is indisputable. Only its degree of advance is uncertain because of the excessive cost of complete automation.

Because of its growing influence, automation deserves serious scrutiny from the standpoint of worker health. One of the most immediate problems coming to our attention is, in some instances, that of greater exposure to noise, resulting from the greater use of electrical motors and equipment in the factory. More nervous strain may also be expected from the character of automatic operations. The effect of errors is more serious, the responsibility of the maintenance worker is higher, and machines are more complex. Eye attention is also intensified by the concentration and close work and the focus on control dials, lights, and panels. As the need lessens for physical effort by workers tending automatic machines, a growth of the health problems associated with the sedentary worker may be expected. We may also expect psychological hazards to the worker from isolation, boredom, and even from increased leisure.

A third factor of health import on the technological scene is the fast-rising number of new chemicals. Figures reflecting the growth of the chemical industry stagger the imagination. Consider, for example, that there are 500,000 distinct chemical compounds in use in industrial



reinstate the arrival of a baby as a family affair. Rooming-in has proved most successful where properly administered. More flexible visiting policies which encourage families to visit the mother and baby have brought no alarming increases in infections nor have had damaging effects on mother and child. The era of rigid seclusion, however, has left its imprint. Certainly not all hospitals in this country have shown recognition that childbirth has more than physical significance. And our contribution to health practices all over the world will long be felt. Recently a physician from one of the medical schools in the United States told of an experience while visiting a hospital in South America. The local physician, who had spent some time at a medical school in this country, showed him the maternity ward. Mothers and babies contentedly shared the same room, with a basket for the baby attached to the bed. Relatives were visiting comfortably, making proper exclamations of pride over the new family member. The doctor apologized for the "primitive" conditions and explained that a new ward was soon to be constructed where babies could be segregated in a nursery according to the best standards in the United States. The U.S. doctor could only protest, "Don't let them! We are now trying to build a new ward to accomplish what you already have here."

The old picture of the family doctor sitting by the bed of the sick child, with parents standing tensely together at the foot, still hangs on many a wall. No one wants to return to that day. The parent of any seriously ill child gives deep thanks for the facilities of the modern hospital. But no parent wishes to be excluded from

his child's care at such a time. It has been adequately demonstrated that effective hospital care does not mean taking over a child and excluding the family from any significant part of the experience. Yet any one of us could tell of cases where the sick child has become the property of the hospital, with visiting hours and conditions prohibitive of family involvement, no planned efforts to maintain the patient as part of the family, and no apparent recognition of family fears, customs, or rightful interest. We could also cite problems arising when we have tried to get these children back in the families at the time the hospital is ready to give up its claim. I hope we can balance these experiences with those where the child was given medical care with an understanding that he was and must remain part of a family, that there were a number of family members and friends important to him, and where the whole experience was one that contributed to the child's development and to the ties which draw a family closer together.

I do not lay at the feet of the already overburdened and conscientious health worker the total responsibility for the rise and fall of family life. The most and the least that we can do, as professional persons concerned with total family health, is to consider all our efforts in the light of their significance for family functioning. We are in a position to make meaningful contributions to family life. When the day comes that all aspects of health, as defined by the World Health Organization, physical, social, and emotional, receive equal concern and emphasis, we may be able to play an even more important role.

as evidenced by these indexes, with the more traditional concepts of pathological change and possible compensable occupational damage.

With the advance of medical knowledge, we may also expect an increase in the number of diseases recognized as occupational. This increase would result from the greater recognition of an occupational factor in certain diseases formerly regarded as common to ordinary life, as well as the growing number of chemicals being introduced in industry.

In addition to improved recognition and detection of occupational diseases, we may look for further progress in their treatment. More recent therapeutic techniques, for instance, have used chelating agents in the treatment of certain illnesses. The chelating agents have the property of selectively removing certain metals from the circulation. For this reason, they have been found useful in treating metal intoxications, such as arsenic and lead poisoning. However, since such agents may also remove essential metals from the body, study has been needed of this possible hazard.

### Sociological Developments

Against this background of change in industrial and medical technology, let us consider some of the sociological developments that influence health and safety needs. Unquestionably, the change in patterns of financing medical care is foremost. The vigorous growth of health insurance coverage reflects the conviction of the American public that the financial risks of illness need to be shared. To an increasing degree, such insurance coverage is being included in management-labor negotiations, so that both labor and management have a real concern about obtaining maximum medical care benefits at a minimum cost. At present, health insurance programs made available and paid for through the worker's place of employment cover more than 37 million employees and their 57 million dependents, a total of 94 million people (2).

The fact that management is increasingly obliged to bear all or part of the costs of illness, occupational or nonoccupational, has certain implications. The immediate effect has been to place increased emphasis on the prevention of

nonoccupational diseases, since these represent the greatest share of sickness costs and absenteeism. Another, and to us a more important, change may be anticipated. Up to now, it has generally been to management's advantage to deny occupational factors in the illness of workers so as to avoid compensation costs. However, as the costs of illness of all types become a management concern, we may expect a shift in this thinking. Management may logically come to view the early recognition of occupational factors as an opportunity to apply primary preventive measures and reduce the overall illness cost.

Another implication of management's concern with all types of employee illness is the possible tightening up of physical requirements for new job applicants. The degree to which this may be carried out is necessarily dependent on the labor supply. In the meantime, however, a very real problem involves the compensation aspects of employing workers with degenerative illness, such as heart disease.

A conservative estimate is that at least 5 percent of the working population has some form of heart disease. As a result of the cardiovascular diseases, an estimated 653,000 man-years are lost annually (3).

Numerous claims have been filed for heart attacks suffered during working hours, and there has often been a wide variation of medical opinion as to whether or not the heart attack was caused by the work. Because of the divergence of medical views, the heart case in industry has been a fertile field for litigation. All too often, cases have been tried on an emotional basis rather than on scientific fact.

In New York State alone, an average of more than \$4 million is paid every year for compensation of heart disease claims. This is 4 percent of the total amount awarded for all compensation claims each year (4).

Some action must obviously be taken if the millions of Americans with cardiac conditions are to be assured of continued employment. One possible solution may perhaps lie in the second injury fund, thereby protecting the final employer from the full brunt of the cost of a disabling illness.

Moving from this facet to the whole picture of workmen's compensation, we may expect to

production, all but a few hundred of them unknown on this earth 20 years ago. (1).

Among the newer, toxic chemicals we find the boranes or boron hydrides. Originally considered for high-energy fuels, these chemicals are now finding their way into industrial applications, as in new plastics. The foam plastics, which are gaining in usage, contain toxic aromatic isocyanates. Likewise, the versatile and numerous epoxy resins which have swept industry have created a problem. Practically no industry using them escapes an increased incidence of dermatitis. Sensitized workers must be removed from the job.

Other industrially important materials potentially hazardous include the organometallic compounds. The carbonyls of iron, cobalt, and nickel are now widely used as catalysts in the petroleum and petrochemical industries. Organic compounds of manganese are being studied as possible substitutes for or supplements to tetraethyl lead in gasoline. Most of these organometallic compounds are highly toxic substances.

These are but a few of a long, growing list of potentially toxic chemicals in the work environment. Continuous study and vigilance is required to determine their health effects and develop means for their control.

In addition to these new problems, we must not lose sight of the older hazards that continue to plague us. Two of the best illustrations are silicosis and lead poisoning. Although much has been accomplished through dust-control measures, silicosis remains the most significant occupational disease in the United States in terms of disability and compensation costs. Likewise, in the lead industries, despite numerous studies and the development of effective control methods, cases of lead poisoning occur every year. While large plants cannot be assumed to be free of occupational health hazards, a larger problem exists in the small plants and in the trades, where the hazards and methods for control may not be fully appreciated, rather than in the place of primary manufacture and use of chemicals.

### Medical Developments

While changes in industrial technology present new challenges, advances in medical tech-

nology may be expected to provide some of the tools to meet these problems. Research on occupational diseases will undoubtedly gain momentum. Similarly, the massive research efforts to control the Nation's chief health problems hold special meaning for us, since 90 percent of industrial sickness absenteeism is believed to be of nonoccupational origin.

One approach is being made through studies to develop early, sensitive diagnostic techniques. In cancer, for example, studies are underway to apply the well-known Papanicolaou cytology technique for uterine cervical cancer to the detection of cancer of other sites. Some findings suggest that cytology can be useful in the early diagnosis of cancer of the genitourinary system. There is also hope for the development of effective anticancer drugs.

Heart diseases and related conditions are another major target. Studies in this area point, for example, to the development of an improved agent for the lowering of blood pressure in patients with hypertension. Considerable attention is also being given to reducing cholesterol, which some believe to be associated with atherosclerosis.

The benefits of some of the tools developed from this broad research may be compounded by applying them to occupational exposures. Thus, as an extension of the Papanicolaou technique, we have used bronchial washings to detect early cancer of the lung in uranium miners. In addition, work is underway to develop specific tests for occupational agents, to permit the detection and control of harmful exposure before irreversible damage occurs. Thus far, in our work in the Public Health Service, we have some indications that vanadium poisoning can be detected by changes in the fingernails long before any clinical symptoms appear. In support of better diagnostic techniques, work is also progressing in various laboratories to develop rapid analytical methods. Our own research, for example, has recently developed methods for the rapid determination of fluoride in urine, of cobalt exposures as evidenced by changes in blood serum, and a micromethod for blood lead determination.

As more sensitive diagnostic techniques are developed, we will be faced with the difficulty of equating concepts of physiological change,

as evidenced by these indexes, with the more traditional concepts of pathological change and possible compensable occupational damage.

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Moving from this facet to the whole picture of workmen's compensation, we may expect to

see some changes here, too. The introduction of new hazards such as radiation, with long latent periods between the exposure and the appearance of damaging effects, is drawing more attention to the need for overhauling compensation practices in general and for correcting existing inequities.

Another problem calling for action relates to one of the basic goals of workmen's compensation—the rehabilitation of the occupationally disabled. We are seeing some progress in this area as the number of persons receiving help from public rehabilitation agencies and the number of those returned to productive employment increase each year. Last year, for example, 171,000 persons received rehabilitation services, and approximately 81,000 were rehabilitated to productive employment. However, our present inability to cope with the situation is reflected in the fact that some 250,000 persons each year reach the point of disability that requires rehabilitation, with an estimated reservoir of 2 million persons. Even more disturbing is the fact that, on the average, 9 years elapse between the time of disability and the time that rehabilitation is started.

A number of developments will be dictated by the changing age characteristic of our labor population. By 1965, the number of men and women in the labor force is expected to rise by 10½ million. Most of the increase will be in the 14- to 24-year-old group and in the 45-and-over age group (5). The increase in each group will be accompanied by its own set of problems.

The younger worker group generally is quite mobile and has a tendency to gravitate to the newer industries. The age and mobility of this group, combined with the long latent period for evidences of ill effects from certain occupational exposures, may well serve to cloak hazards inherent in those newer operations. Because of this and because some of the newer hazards could affect generations yet unborn in the families of exposed workers, we cannot wait for cases of illness to develop before taking steps to evaluate and control potentially hazardous exposures.

The problems of the older group will be felt in various areas. In the field of rehabilitation, for example, some accommodations may be necessary to meet the needs of an aging population.

Some have suggested extension of the present vocational goal of the program to also help people achieve a higher level of self-care.

Another sociological influence of this age factor is evident in the estimate that by 1975 the number of physicians' services needed because of chronic disease will increase by more than 50 percent (6). These demands of an aging population cannot but increase the problems associated with a growing physician shortage.

It has been estimated that merely maintaining the current ratio of physicians to population will require, by 1975, something like twice as many new medical school graduates each year as we now have (7). Pyramiding medical research needs may also be expected to drain off larger numbers of medical personnel. A consultant group to the Secretary of Health, Education, and Welfare, headed by Dr. Stanhope Bayne-Jones, estimated that by 1970 there would be a shortage of 6,000 medical researchers, as well as shortages of technicians, nurses, and other ancillary personnel.

The shortage of trained medical, nursing, and industrial hygiene personnel is also reflected in official occupational health agencies and in industry. Dr. Robert Kehoe has estimated that there is need for 10 industrial physicians and industrial hygiene engineers for every 1 now employed (8).

Industry, the health professions, educational institutions, and government may have to take another hard look at present educational opportunities and facilities to see how they can infuse them with a new vitality to meet these current and projected needs.

Training of additional personnel, we recognize, is only a partial answer. Better utilization of ancillary personnel may help conserve medical manpower and provide greater opportunities for service to the other members of the professional health team.

One means to accomplish better utilization and conservation is through the application of screening techniques. The value of screening techniques has been the subject of considerable controversy, but I believe that much of it is based on lack of understanding of their purpose and use. Screening examinations were never meant to be a substitute for physical examinations. Their value lies in extending

early detection services to persons who could not otherwise be expected to have the benefit of a physical examination. This value, however, can be realized only if adequate provisions are made for referral to the private physician for followup. There is no point to finding out that an apparently well person has an elevated blood pressure, a spot on the lung, or high blood sugar unless this condition is carefully investigated by a physician. Used properly, these examinations can serve as efficient detectors of disease in early stages, at the same time substantially decreasing the demand for and costs of medical and hospital services. I believe these techniques hold great promise for industry.

Since the shortage of professional personnel extends to governmental agencies, these groups, too, can effect better utilization of their personnel through closer working relationships between labor and health departments, compensation boards, and rehabilitation agencies. All too often, the administrators of these agencies within the same State do not even know each other's names. I am convinced that many benefits would accrue if the personnel of these agencies would become acquainted with each other and explore mutual problems and opportunities.

Such cooperative efforts would further contribute to the identification and more effective study and control of new occupational health hazards. At present, there are 76 official occupational health agencies in 40 States, staffed by 484 professional personnel. This staff reaches only 10 percent of the Nation's work force in any one year. This coverage can be greatly increased by a closer working relationship between the various agencies concerned with

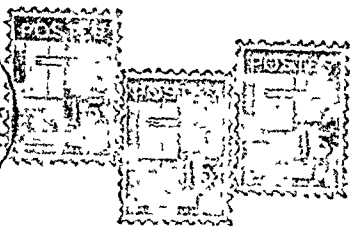
occupational health and safety. By joining forces, we may be able to attack more successfully the absence of even the most rudimentary type of industrial hygiene program in over one-half of the industrial plants in the United States. In the face of a constant, growing stream of new hazards introduced by a changing technology, we must effectively multiply our efforts if only to stand still and not lose ground.

The total health and safety job confronting us is nothing short of gigantic. There is more than enough for all of us to do. And to the degree that we combine our resources and permit a cross-fertilization of ideas and experiences, we will make greater headway toward our mutual objective of worker protection.

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★ Health services in the United States occupy 250,000 physicians, 475,000 professional nurses, 875,000 other professional and technical hospital personnel, and 800,000 other health agency personnel, a total of 2,400,000 potential readers of *Public Health Reports*. There is a subscription blank on the inside back cover.



## Pushing Fish

To promote the eating of fish, Morocco's Ministries of Public Health and Interior sold fresh sardines at half price (7 cents a pound) for 2 weeks to some 100,000 dwellers in shanty towns on the outskirts of Rabat. Most of them have never tasted seafood and can afford meat only once every 4 or 5 months.

The Government's aim is to develop new food habits among those whose diet is deficient in protein, to show merchants how to profit from increased sales of fish at lower prices, and to stimulate the fishing industry which is operating below full capacity.

The ministries used press, radio, and movie publicity and broadcast from loudspeaker trucks such slogans as "One and a half kilos of fish is just as nourishing as one kilo of meat—and only one-fourth the price." Social workers set up stands in the shanty towns to demonstrate how to clean and cook sardines.

The Government plans to promote canned sardines in the inland areas where there is no refrigeration.

Morocco has a fishing fleet of nearly 2,000 trawlers and other boats which catch about 100,000 tons of fish, mostly sardines, a year. Many canning factories are closed because their products are not meeting price competition in foreign markets.

## Hospital on the Amazon

Far up the Amazon, on Brazil's frontier with Colombia and Peru, at Benjamin Constant is the only hospital within 500 miles. A few patients are flown to the hospital; some arrive by river boat; but most are brought by paddling hours or days in the family canoe.

We make supervisory visits there only once a year. When I arrived at the hospital in 1957, about a year after it had opened, the X-ray machine was inoperative because of a grounded cable, the electrical connections for the hot water heater were not

completed, the oil burner in the kitchen was not functioning, and the flatwork ironer gave the employees shocks. The staff was anxious to learn, however, and soon, with adjustments, repairs, and instructions translated for the staff, nearly all equipment was working, and the hospital was functioning effectively.

When I returned a year later, accompanied by Dr. José Chaves, chief of medical services of the Amazon Program, all the equipment was still operational. However, an increased patient load was taxing the one doctor and one graduate nurse responsible for the care of both hospital and ambulatory patients. We offered suggestions as to clinic hours to permit more time for hospital patients and surgery and recommended to the Amazon Program Office of Serviço Especial de Saúde Pública that another doctor and graduate nurse be added to the hospital staff. The patient load, already so great that the present staff can no longer cope with it, will increase.

—KENNETH L. WINTERS, hospital administration consultant, U.S. Operations Mission, Brazil.

## New Physicians for Indonesia

When 97 medical students were graduated from the University of Indonesia in August 1959, the new physicians, 21 of them women, took professional oaths according to their religions: Moslem, Protestant, Catholic, Hindu-Bali, or Buddhist.

The medical school of the university has collaborated with the University of California in the development of a new curriculum to increase the supply of physicians. (Indonesia now has about 1,000.) The period of training has been cut from 7 years to 6, with a new system of periodic examinations and clinical work integrated with theory.

Under a 6-year contract, the affiliation between the two universities was financed with \$1,900,000 contributed by the United States. In addition, the International Cooperation Administration provided \$900,000 to pay for advanced study in the United States for 125 students and \$500,000 to purchase equipment. Indonesia reported spending about \$6,250,000 for buildings, 10 houses for visiting professors, and administrative expenses. The University of California expects to start a similar affiliation in 1960 with the medical school at Airlangga University in Surabaya.

# Synthetic Detergents in Well Water

JEROME DELUTY

THE presence of synthetic detergents, or "syndets," in ground water is being reported with increasing frequency, and the number of incidents may be expected to rise still more as housing developments are constructed in areas not served by either public water supplies or public sewers. A study in Suffolk County, N.Y., for example, found that many wells contained detergents (1). A committee has been formed by the Research Steering Committee of the Association of American Soap & Glycerine Producers, Inc., to investigate factors associated with such pollution (2).

In Rhode Island, the department of health has since January 1959 found synthetic detergents in samples from 72 wells in various localities in the State. These detergents were first noticed by the formation of a soapy foam in the bottle upon shaking, and their presence was confirmed by laboratory analysis. The presence of syndets in all these wells was believed to have resulted from their leaching through the ground into the ground water. Unlike soaps, which are precipitated by the calcium and magnesium in the water and left behind, synthetic detergents are only partly removed by a septic tank and absorption field. They are very stable chemicals and will travel appreciable distances through the ground into the water table and move with it.

The health department's analysis of well water, performed on application to the department, consists of physical examination, sanitary chemical analysis, and bacteriological examination. Specific tests include turbidity, sediment,

odor, color, nitrogen as free ammonia and albuminoid ammonia, nitrite and nitrate nitrogen, chloride, 20° C. and 35° C. plate counts, and coliform tests. Since January chemical tests for synthetic detergents have been performed routinely if the water appears soapy. A survey form, filled out by the collector of the sample, must accompany each sample. This form tells the type of well, its construction, and its location with respect to sources of pollution.

The following statistics pertain to the wells we have found to contain syndets:

- 47 percent were analyzed because of taste and odor complaints; 7 percent, because of foaming.
- 56 percent were positive for coliform group bacteria; 89 percent were considered grossly polluted on the basis of a sanitary chemical analysis.
- 21 percent were located in the cellar of the house.
- 44 percent were dug wells; 23 percent were driven wells; and 31 percent were drilled wells.
- 73 percent were within 50 feet of the sewage disposal unit; and 94 percent were within 100 feet of the sewage disposal unit.

Almost all these wells would be considered polluted on the basis of the chemical or bacteriological examination. If a well is so constructed and located that it is possible for it to be contaminated by the sewage disposal units, it is likely that syndets will be recovered from the well.

In certain areas, detergent contamination has been found to extend into most of the wells of a locality. One such area is the Quaker Hill Subdivision in Portsmouth, R.I., which consists of about 50 homes with no public sewers and no public water supply. This subdivision was developed during the period 1953 to 1958. The

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*Mr. Deluty is a chemist with the Rhode Island Department of Health. The paper is based on one he gave at the New England Health Institute, Providence College, Providence, R.I., in June 1959.*



**Analysis of 25 wells, Quaker Hill subdivision, Portsmouth, R.I.**

Well No.	Depth (feet)	Turbidity	Sediment	Color	Free ammonia (ppm N)	Albuminoid ammonia (ppm N)
1	130	0	0	0	0.000	0.016
2	125	0	Soapy	0	.000	.016
3	140	0	Soapy	0	.000	.008
4	150	0	Soapy	0	.000	.016
5	200	0	Soapy	0	.005	.032
6	227	0	Soapy	0	.000	.024
7	300	0	Soapy	0	.400	.032
8	250	0	Soapy	5	.000	.032
9	145	0	Soapy	0	.000	.016
10	145	0	Soapy	0	.000	.016
11	135	0	Soapy	0	.008	.040
12		0	Soapy	0	.000	.000
13	60	0	Soapy	0	.160	.024
14	135	0	Soapy	5	.016	.024
15	160	0	0	0	.000	.016
16	225	0	Soapy	0	.000	.056
17	175	0	Soapy	0	.024	.056
18		0	Soapy	0	.000	.024
19	150	0	0	0	.000	.016
20	100	0	0	0	.000	.032
21	140	0	Soapy	0	1.000	.024
22	140	0	0	0	.000	.000
23	100	0	0	0	.000	.000
24	300	0	0	0	.000	.000
25	275	0	Soapy	0	.000	.008

Well No.	Nitrate (ppm N)	Nitrite (ppm N)	Chloride (ppm Cl)	Detergent (ppm A.B.S.)	Coliform	Distance from disposal field (feet)
1	4.0	0.002	33	0.0	+	70
2	10.0	.007	25	.59	0	30
3	6.0	.004	22	.55	0	50
4	15.0	.002	23	.52	0	30
5	.5	.140	38	2.4	0	
6	7.0	.000	43	2.5	0	50
7	3.0	.200	32	2.75	0	65
8	5.0	.006	28	5.0	0	35
9	7.0	.007	39	2.65	0	63
10	10.0	.000	25	3.75	+	50
11	20.0	.017	42	4.00	0	50
12	10.0	.004	33	.57	0	60
13	15.0	.070	37	2.5	+	85
14	15.0	.001	28	.57	+	115
15	10.0	.002	21	.26	0	30
16	10.0	.002	46	2.60	0	62
17	10.0	.004	33	3.75	+	75
18	6.0	.002	30	1.75	+	
19	7.0	.000	25	.65	0	150
20	10.0	.001	25	.25	0	45
21	7.0	.002	37	2.00	0	50
22	7.0	.001	26	.15	0	50
23	6.0	.001	27	.27	0	40
24	10.0	.001	21	.25	0	80
25	10.0	.002	23	1.10	0	75

<sup>1</sup>Determined by methylene blue, given as parts per million alkyl benzene sulfonate.

NOTE: All drilled wells located in rock. Bedrock is 8-10 ft. below surface of ground.

house lots vary in size from 7,000 sq. ft. to 15,000 sq. ft., with the average lot being approximately 8,850 sq. ft. The individual wells are drilled through the overburden into Pennsylvania sandstone, shales, and conglomerates. Water is furnished through openings along bedding plains and openings in the zone of fractures. These homes have septic tanks and absorption fields for sewage and waste disposal, but as the lot sizes are fairly small, most of the wells are within 75 feet of the disposal unit.

A total of 25 wells in this area were analyzed, and all but 1 contained detergents. The amount ranged from 0.15 to 5.0 ppm (see table). Upon shaking, most of the samples showed a soapy foam, but several did not. The detergent level of those that did not appear soapy was in the range of 0.15 to 0.4 ppm. We have found that generally a syndet concentration of at least 0.50 to 0.60 ppm is necessary to cause a soapy foam; the higher the concentration, the more abundant and more persistent the foam.

Only 6 of the 25 wells showed any laboratory evidence of bacteriological contamination, and few exhibited high nitrogen values. The only form of nitrogen that tended to be abnormally high for this area was the nitrate nitrogen.

Many of the wells in this subdivision would be considered safe on the basis of routine bacteriological and chemical examination. Because of the presence of detergents, however, we have considered them polluted or potentially

polluted. Presence of detergents, if their concentration is high enough, is evidence that seepage from the sewage disposal field is finding its way into the wells. Under these conditions, the wells must be viewed with suspicion and considered polluted if the sanitary survey so suggests. For example, there would be no reason to question the safety of wells Nos. 2 and 3 on the basis of the bacteriological and chemical examinations. However, since these wells contain detergents and are located near the sewage disposal system, we feel they are unsafe and we recommend their abandonment.

The Rhode Island Department of Health, in its subdivision recommendations, has recognized the difficulties of maintaining safe drinking water and safe sewage disposal facilities in close proximity to each other. The department recommends lot sizes of at least 2 acres in areas where there are no public water facilities and a distance of at least 100 feet between any well and any sewage disposal unit.

#### REFERENCES

- (1) Flynn, J. M., Andreoli, A., and Guerrera, A. A.: Study of synthetic detergents in ground water. *J. Am. Water Works A.* 50: 1551-1562, December 1958.
- (2) Moss, H. V.: Review of 1958 A.A.S. & G.P. research investigations related to detergents in water and sewage treatment. Presented at the annual meeting of the Association of American Soap & Glycerine Producers, Jan. 21, 1959, New York City.

### Compilation of Air Pollution Research Projects

An inventory of air pollution projects active during 1959 is under preparation by the American Society of Mechanical Engineers Task Group on Research in Air Pollution. Researchers as well as organizations will be included.

Organizations and research personnel desiring to be listed may communicate with Austin Heller, Chairman, Task Group-Air Pollution Research, American Society of Mechanical Engineers, 29 West 39th Street, New York 18, N.Y.

# Signs

and

# Symptoms

## *of trends in public health*

How do temperature, humidity, and barometric pressure affect morbidity, crime, accidents, and mental health? The Health Department of New York City, in cooperation with the Public Health Service, is compiling data in the search for an answer.

» »

For the first time in medical history, a comprehensive picture of sickness and health in a single community will be created eventually at Tecumseh, Mich. A complete health survey of more than 8,000 residents is scheduled under a 2-year grant to the School of Public Health of the University of Michigan by the National Heart Institute, Public Health Service. Each person will be told the results of the examination and family physicians will receive detailed medical reports. Special details on heart disease and related disorders will be sought.

» »

The end of the era of plentiful and cheap water in the United States has been reached, states a pamphlet prepared by Princeton University for a conference on ground water last spring. Dr. J. M. Roger De Wiest of Stanford University, a specialist in ground water flow, has joined the Princeton faculty to assist in developing a 5-year plan of teaching and research on water supply.

» »

Ten million people in the United States are rheumatic patients, one-half suffering from arthritis and 200,000 permanently crippled, estimates Dr. Philip S. Hench of the Mayo Clinic.

Conversion of salt water to fresh by a process known as long-tube vertical multiple-effect distillation gives promise of a remarkable breakthrough, according to Secretary of the Interior Fred A. Seaton. The process will be tested at Freeport, Tex., in a demonstration plant designed to produce 1 million gallons of water per day at an estimated cost of about \$1 per 1,000 gallons. This is 50 percent cheaper than the cost of converting sea water to fresh in the most efficient commercial plant in operation in the world today.

» »

Four fallacies concerning mental illness were listed recently by Dr. Mathew Ross, medical director of the American Psychiatric Association: (1) The mentally ill could "snap out of it" with a little effort. (2) It's stylish to go to the psychiatrist; mentally ill persons can be recognized because they are violent. (3) Anyone who is not mentally ill is mentally healthy. (4) Tranquilizers are wonder drugs that cure mental illness.

» »

Under certain conditions, epilepsy is not a barrier to Federal employment. A policy followed by the Civil Service Commission for a number of years was explained in a pamphlet issued by the Commission in August 1958, "Employment of Epileptics in the Federal Service." Although the policy is not a new development, the issuance of the pamphlet and ensuing correspondence with the National Epilepsy League resulted in considerable publicity at the time of the meeting of that organization in

Chicago in August 1959. The Commission continues to hold, as stated by its medical director, Dr. Eugene R. Chapin, that epileptics are employable if their seizures are adequately controlled and job placement is selective.

» »

Today's retirement policies and practices and their impact on the Nation's economy will be examined at Cornell University for the next 3 years under a Ford Foundation grant. Sponsored by the New York State School of Industrial and Labor Relations at Cornell, the study group will evaluate retirement policies of both industrial and nonprofit organizations, as well as community attitudes.

» »

Thirty countries are now participating in the Public Health Service's international fellowships program since 17 countries of Central and South America and the Australasian area were added. Started in 1958, the program gives postdoctoral medical research training in this country to scientists from abroad. Applicants, nominated by their country's panel of scientists and approved by a fellowship board of the National Institutes of Health, receive from the Public Health Service a basic annual stipend of \$4,500, allowances for wives and children, and limited travel funds.

» »

Accidents in pleasure and instructional flying will be the subject of nationwide study through a recent grant by the Public Health Service. The grant of \$77,600 to Flight Safety Foundation will permit development of a long-range research plan for experiments in prevention by specialists in biostatistics, physiology, psychology, mathematics, education, and public health.

» »

A comprehensive community plan for meeting the problems of chronic illness, the result of 15 years of exhaustive study and experience in the Chicago area, is given in volume 22 of *The Proceedings of The Institute of Medicine of Chicago*, dated May 15, 1959.

# Locally Oriented Health Careers Manual

WILLIAM J. MEYER, M.D., M.P.H.

**P**ERSONAL interviews with several guidance counselors brought out the need for (a) locally oriented information about careers in the field of health, and (b) a sourcebook containing all the specific information, both scholastic and financial, useful to a high school student in deciding on a career consistent with the criteria of choice and ability.

Guidance counselors are busy people. It is impossible for them to check through their considerable library of source materials to find, for each student being counseled, detailed information on job descriptions, course requirements, institutions offering training in the career in question, academic costs, scholarship and other financial aid available, and all the other facts a young person needs to help him plan a career.

Early in 1958 the Glens Falls District Office of the New York State Department of Health undertook to provide these facts about careers in health in the form of a health careers manual. This decision was made because of the realization that, if the counselors were to be more effective in recruitment for health, they must have a better tool than any at that time available to them.

It is true that they had the excellent "Health Careers Guidebook," published by the National Health Council, and the other equally good recruitment materials published by the council and other agencies. However, the Guidebook was published in 1955 and certain parts of it, such as salaries and training costs, were already somewhat out of date; it also lacked specific information on financial aid and local sources of additional information, all important facts to a young person considering a health career.

Obviously, local orientation is impossible in a sourcebook designed for national distribution.

Guidance counselors are an important group in any program of career recruitment because they exert a significant influence on high school students' decisions. Like everyone else, they must perform their services within the limitations of the resources available to them. It is only natural that they will be more successful and will put a little more emphasis in those areas in which they have effective tools.

Therefore, it was decided to design a manual that would encourage the counselors to emphasize health careers. It was also decided to borrow material freely and to devise a book that would be easy to handle and simple to revise annually.

## Format

The manual consists of 35 folders made from index paper, each containing a pocket on the left side. Front and back covers are of heavy, embossed fiber paper, and the book is bound together by a multiple-grip plastic binder.

Stapled inside the front cover are these instructions.

## INSTRUCTIONS IN THE USE OF THIS MANUAL

This notebook has been designed with the hope of providing guidance counselors and students with a tool whereby they can obtain sufficient information to help them decide on a career in health. The format is such that any specific information can easily be found. For each health category there is also information on whom to contact for additional details.

The first section of the book consists of two lists of scholarships, neither of which is all inclusive. The first includes general scholarships which are available to high school graduates planning on entering the field of health (as well as other fields).

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*Dr. Meyer is district health officer of the Glens Falls District, New York State Department of Health.*

The second list gives information on scholarships available in specific careers.

The rest of the book consists of a descriptive page for each health career, accompanied by recruitment literature which in most instances has been supplied by the officially recognized national or State association in each field. In a few instances there is no such literature because none is available. The descriptive page gives the following information under separate headings:

- The job
- Salary
- Opportunities
- Training needed
- Cost
- Schools (partial list of nearby schools)
- Further information (where to obtain)

The lists of scholarships, as mentioned above, are far from complete. However, it is hoped that annual revision of this notebook will be possible and that with each annual revision the scope of these lists will be expanded.

In listing the general scholarships for local high school graduates, an attempt was made to include information on those available through the schools specifically mentioned in the descriptions of the individual careers; however, the list is not complete. The list of scholarships available to local-graduates for training in specific health careers is arranged according to particular careers. This list is national in scope and is more definitive than the general scholarship list.

The rest of the manual consists of 34 folders, each one devoted to a single career, although in a few instances one folder contains information on several related careers. Stapled on the right, inside each folder, is a 1-page, mimeographed job description sheet. The 40 careers described, including hospital careers as 1 group, are the following:

Administrator, public health	Medical technologist
Chiroprapist	Nurse, registered
Dental assistant	Nurse, psychiatric
Dental hygienist	Nurse, industrial
Dental laboratory technician	Nurse, public health
Dentist	Nurse, school
Dietitian	Nurse, practical
Hospital careers	Occupational therapist
Industrial hygienist	Optometrist
Medical librarian	Orthoptic technician
Medical record librarian	Osteopathic physician
Medical record technician	Pharmacist
Medical secretary	Physical therapist
	Physician
	Psychologist

Public health educator	Social worker, psychiatric
Radioisotope technician	Speech and hearing therapist
Research, health (chemistry, biochemistry, physics, physiology)	Statistician, public health
Sanitarian	Veterinarian
Sanitary engineer	Vocational rehabilitation counselor
Social worker, medical	X-ray technician

In the pocket on the left side of each folder are recruitment pamphlets obtained from the national or State headquarters of the official organization for a particular discipline. If no official organization exists for members of a specific discipline, recruitment material was obtained from more general sources such as the Hospital Association of New York State, the American Society of Clinical Pathologists, and the Public Health Service. This literature presents information that supplements and expands upon that given in the job description sheet. In a few instances these pockets are empty, because diligent inquiry failed to unearth any existing recruitment literature.

### Plans for Revision

It is planned to revise the manual annually and to have the revisions in the hands of the guidance counselors in time for the second half of the school term when most vocational guidance activity occurs.

The format of the manual makes it easy to revise. Recruitment pamphlets can be changed merely by substituting new ones for old. Minor changes in the job description sheet can be inked in. If a revision is extensive, the old sheet can be discarded and a new one stapled in. It is equally simple to revise the two scholarship lists by inking in minor changes, substituting pages, or stapling in a complete new list. The revisions with an instruction sheet will be mailed to the counselors.

### Discussion

When they first received the manuals, the local guidance counselors were enthusiastic. They were particularly pleased with its scope and local orientation and the fact that all the information was available in a single source.

After using it from January 14 to May 1, 1959, they received the following questionnaire:

1. Have you any definite knowledge that the manual has increased interest among your students in a health career? Yes — No —

2. If yes, what is your rough guess, *without consulting your records*, of any increase over previous years in the number of this year's graduating class planning to enter a health career? —

3. Now that you have had the opportunity to use the manual, has it been of value to you in your work? Yes — No —

4. Would you please list any suggestions you have for improvement of the manual.

The replies to these questions did not provide objective, quantitative data; the questionnaire was deliberately so planned because it was felt that if the people using the manual indicated its value to them, this expression would be sufficient to justify continuation of the project. Also, since guidance counselors are busy, no more information was solicited from them and compiled than was necessary to accomplish our purpose.

Twenty-three of the 28 school guidance departments answered the questionnaire. Seventeen answered "Yes" to question 1, five answered "No," and one stated the manual had not been in use long enough to determine.

The answers to question 2 included 12 positive statements. Five stated that it had stimulated interest in lower classes (10th and 11th grades). Six did not answer this question.

All 23 respondents answered question 3 affirmatively.

Answers to question 4 were as follows: 11 stated the manual to be excellent and needed no improvement, 1 suggested more "picture-type" folios, 1 wanted more empty pockets to hold additional material, 2 stated the manual should be kept up to date, and 1 wanted a smaller manual. Seven did not answer.

Collecting the material for the manual was a task of considerable magnitude. The most difficult job, however, was the process of selection. Much more good recruitment material is available than can be included in a volume of this type and still keep it to a size that is easily handled. The author found the health careers materials of the Empire State Health Council and the State Charities Aid Association of particular value. The pamphlets selected are purely a matter of personal judgment; other persons would undoubtedly make a dif-

ferent choice. The titles and sources of the recruitment literature inserted in the health careers manual are listed at the end of the article. Job description sheets had to be rewritten many times to achieve the desired degree of brevity, and many excellent leaflets and pamphlets had to be ruthlessly weeded out.

No claim is made to any originality in any of the material included in the manual. We borrowed freely. The only merit to the manual is that it is a compendium of much existing material and provides a single source for all the information a young person in this locality needs to help him decide on a future career in health.

There is no doubt as to the value of the local orientation of the manual. All scholarships originating within the health jurisdiction are listed; any scholarship whose restrictions make local students ineligible for it has been omitted. Finally, when the training is available from many schools, only those nearest at hand are listed. No information on student loans is included.

Creation of the manual is only the beginning of the district office's activities in recruiting for health careers. A number of local official and voluntary health organizations have an interest in this effort, and several have established active programs. It is hoped that an areawide health careers committee can be established to facilitate coordination of present activities and to stimulate a broadened program. Such an expanded program might include (a) extension of surveys of local opportunities in health careers, (b) expansion of the health careers programs presented in the schools, (c) health careers workshops for school personnel, and (d) a speakers bureau to supply schools with speakers who represent the various health professions.

### Summary

A locally oriented health careers manual was created by the Glens Falls District Office of the New York State Department of Health and distributed to all school guidance departments within the health jurisdiction.

The value of this particular manual lies in its comprehensive format and its local orientation.

It supplies, within a single, easily handled volume, all the specific information needed by a high school student to help him decide on a career in the health field. The material is arranged for easy reference. Annual revisions can be incorporated with a minimum amount of effort.

The manual has been well received by local guidance counselors. They have expressed the opinion that it has proved of definite value to

them in their work, and that it is a useful instrument in recruiting more high school graduates for health careers.

The manual is the first step in the recruiting activities of the district office. Other possibilities for future efforts are suggested. They include formation of an areawide health careers committee and providing the schools with workshops, speakers, and additional programs to stimulate interest in the health professions.

### Recruitment Literature Used in Health Careers Manual

*"Stepping Up to a Career."* American Podiatry Association, 3301 16th St. NW., Washington 10, D.C.

*"Be a Dental Assistant."* *"Dear Jill."* American Dental Assistants Association, 410 First National Bank Building, LaPorte, Ind.

*"Dental Hygiene Aptitude Testing Program."* American Dental Hygienists Association, 304 East 45th St., New York 17, N.Y.

*"Accredited Dental Hygiene Schools."* American Dental Association, Council on Dental Education, 222 East Superior St., Chicago 11, Ill.

*"I Am a Dental Hygienist—May I Interest You in My Profession?"* Dental Society of the State of New York, Council on Dental Health, Hotel Granada, 268 Ashland Pl., Brooklyn 17, N.Y.

*"Careers in Dentistry."* *"Dental Aptitude Testing Program."* American Dental Association, 222 East Superior St., Chicago 11, Ill.

*"Should You Be a Dentist?"* New York Life Insurance Co., 51 Madison Ave., New York 10, N.Y.

*"Dietetics as a Profession."* *"Chart our Course Toward Dietetics."* *"The Future is Bright—Look Ahead."* *"Dietitians in Demand."* American Dietetic Association, 620 North Michigan Ave., Chicago 11, Ill.

*"Hospital Careers."* Hospital Association of New York State, Inc., 11 North Pearl St., Albany 7, N.Y.

*"Hospital Administration as a Career."* American College of Hospital Administrators, 620 North Michigan Ave., Chicago 11, Ill.

*"Be a Medical Librarian!"* *"Choose Medical Librarianship."* Medical Library Association, % Martha R. Neville, Presbyterian and Woman's Hospitals, 230 Lothrop St., Pittsburgh 13, Pa.

*"Face the Future With Security."* *"About to Choose a Career?—Consider Medical Record Library Science."* American Association of Medical Record Librarians, 510 North Dearborn St., Chicago 10, Ill.

*"Approved Schools of Medical Technology."* American Medical Association, Council on Medical Education and Hospitals, 535 North Dearborn St., Chicago 10, Ill.

*"The Profession of Medical Technology—A Career of Service in Science."* *The Registry of Medical Technologists of the American Society of Clinical Pathologists."* American Society of Clinical Pathologists,

Registry of Medical Technologists, Mrs. Ruth Drummond, Registrar, Muncie, Ind.

*"Your Career in Nursing—A Directory of Schools of Nursing in N.Y. State."* New York State Nurses Association, Katherine E. Rehder, Executive Director, 385 State St., Albany 10, N.Y.

*"Careers in Mental Health as a Psychiatric Nurse."* (PHS Pub. No. 26.) U.S. Public Health Service, Washington 25, D.C.

*"Picture of a Woman With a Future."* American Nurses Association, Industrial Nurses Section, 2 Park Ave., New York 16, N.Y.

*"On the Way Up—Practical Nursing."* National Association for Practical Nurse Education, 634 Madison Ave., New York 21, N.Y.

*"Should You Be a Nurse?"* New York Life Insurance Co., 51 Madison Ave., New York 10, N.Y.

*"The Public Health Nurse in Your Community."* U.S. Public Health Service, Washington 25, D.C.

*"Your Career in Public Health Nursing."* *"For Those Who Need Her—Meet Your Public Health Nurse."* New York State Department of Health, 84 Holland Ave., Albany, N.Y.

*"Facts About Occupational Therapy."* *"Before You Enter An Occupational Therapy Course."* *"Play On the Recovery Team—Be An Occupational Therapist."* *"Colleges and Universities Offering Courses in Occupational Therapy."* American Occupational Therapy Association, 250 West 57th St., New York 19, N.Y.

*"Planning Your Professional Career—Optometry."* American Optometric Association, 4030 Chouteau Ave., St. Louis 10, Mo

*"A Profession in Orthoptics—Needed, Satisfying, Profitable."* American Orthoptic Council, John W. Henderson, M.D., Department of Ophthalmology, University Hospitals, Ann Arbor, Mich.

*"The Osteopathic Profession and Its Colleges."* American Osteopathic Association, 212 East Ohio St., Chicago 11, Ill.

*"Should You Be a Pharmacist?"* New York Life Insurance Co., 51 Madison Ave., New York 10, N.Y.

*"Physical Therapy Programs Approved by the Council on Medical Education and Hospitals of the American Medical Association."* *"Physical Therapy Offers*

*You a Rewarding Career of . . . Service, Satisfaction, Security."* *"Sources of Financial Assistance for Physical Therapy Students."* American Physical Therapy Association, 1790 Broadway, New York 19, N.Y.

*"Should You Be a Doctor?"* New York Life Insurance Co., 51 Madison Ave., New York 10, N.Y.

*"So, You Want To Be a Doctor?"* American Medical Women's Association, Inc., 1790 Broadway, New York 19, N.Y.

*"Medical Internships in the Public Health Service."* U.S. Public Health Service, Washington 25, D.C.

*"Careers in Mental Health—Psychiatry, Psychiatric Social Work, Psychiatric Nursing, Clinical Psychology."* (PHS Pub. No. 23.) *"Careers in Mental Health . . . As a Psychologist."* (PHS Pub. No. 27.) U.S. Public Health Service, Washington 25, D.C.

*"Health Education as a Career."* Society of Public Health Educators, 1790 Broadway, New York 19, N.Y.

*"Careers in Physiology."* American Physiological Society, 9650 Wisconsin Ave., Washington 14, D.C.

*"Shall I Study Chemistry?"* American Chemical Society, 1155 16th St., NW., Washington 6, D.C.

*"Toward a Healthier World—Your Career in Sanitary Engineering."* U.S. Public Health Service, Washington 25, D.C.

*"More Than a Job . . . Medical Social Work."* National Association of Social Workers, Inc., Medical Social Work Section, 95 Madison Ave., New York 16, N.Y.

*"Is This Your Line?"* National Association of Social Workers, Inc., Psychiatric Social Work Section, 95 Madison Ave., New York 16, N.Y.

*"Careers in Mental Health . . . As a Psychiatric Social Worker."* (PHS Pub. No. 28). U.S. Public Health Service, Washington 25, D.C.

*"Educational Qualifications of Public Health Statisticians."* American Public Health Association, 1790 Broadway, New York, N.Y.

*"Veterinary Medicine as a Career."* American Veterinary Medical Association, 600 South Michigan Ave., Chicago 5, Ill.

*"Colleges and Universities Receiving Teaching and Traineeship Grants for Rehabilitation Counselor Training, 1958-1959 Academic Year."* Office of Vocational Rehabilitation, U.S. Department of Health, Education, and Welfare, Washington 25, D.C.

*"Careers in X-ray Technology."* American Society of X-ray Technicians, 16 14th St., Fond du Lac, Wis.

*"Health Careers Calendar."* National Health Council, 1790 Broadway, New York 19, N.Y.

## Estimates of Acute Illness and Injury Among Children

Young children suffered acute illnesses with twice the frequency of adults during the year ending June 30, 1958, according to a report issued by the U.S. National Health Survey of the Public Health Service. The incidence rates for acute conditions involving medical attention or activity restriction ranged from an average high of four occurrences a year for children under 5 years old to a low of two for adults 25 years or over.

The report, which reveals the relative concentration of these illnesses and injuries—including everything from chickenpox and sore throat to appendicitis and broken legs—among children states that adults over 25 averaged 24.1 days of restricted activity from illness or injury per person during the year, compared with a range of 13.2 to 16.4 for age groups under 25.

Home accidents among children under 15 years of age were the chief cause of injuries restricting activity or requiring medical attention. They were an important cause, along with motor vehicle and work accidents, of restricted activity in the 15-24 age group.

The estimates are derived from interviews conducted for the National Health Survey by the U.S. Bureau of the Census with a representative sample of the civilian, noninstitutional population. The information recorded about individuals is confidential; only statistical totals are published.

The report is entitled "Children and Youth, Selected Health Characteristics, United States, July 1957-June 1958."



## Tel'tsa Provacheka pri Trakhome i Ikh Epidemiologicheskoe Znachenie

### Prowazek Bodies in Trachoma and Their Epidemiological Significance

F. F. SYSOYEV

The original version in Russian appeared in *Vestnik Oftalmologii* (Journal of Ophthalmology), Moscow, March-April 1956, pages 3-9. Docent Sysoyev is head of the eye disease clinic of the Izhevsk Medical Institute, in Udmurt, A.S.S.R., R.S.F.S.R. The paper was translated in the Russian Scientific Translation Program of the National Institutes of Health, Public Health Service. It is presented here because of its interest to both ophthalmologists and public health workers.

**THE DISCOVERY** of bacterial carriage, the elucidation of the role of the human carrier in the spread of contagious diseases, and the development of epidemics are of exceptionally great importance.

At the present time, the carrier state has been studied and established for many diseases, for example, typhoid fever, bacterial dysentery, cholera, diphtheria, scarlet fever, plague, tularemia, brucellosis, pertussis, epidemic hepatitis (Botkin's disease), poliomyelitis, syphilis, tuberculosis, and in a number of ultravirus (N. F. Gamaleya), protozoan (various types of malaria), and other infectious diseases (I. R. Drobinskiy, 1953).

Trachoma has long been recognized as an infectious disease, and recent investigations have almost completely confirmed the virus origin of

it. The elementary bodies of the Prowazek-Halberstaedter intracellular inclusions are considered to be the only causal agents of trachoma (V. V. Chirkovskiy, M. P. Chumakov, Sh. D. Moshkovskiy, A. A. Avakyan, N. A. Zaytseva, A. L. Kankrov, P. N. Zhurin, Grosfel'd, P. Thygeson, Ishihara, and others).

We have set before ourselves the task of clarifying, by means of conjunctival scrapings for Prowazek-Halberstaedter bodies, the question of whether a carrier state exists in clinically healthy persons in foci of trachoma and in those who are clinically cured convalescents, that is, in stage 4 of trachoma.

In the literature available to us we have not been able to find much information concerning the detection of Prowazek bodies in the clinically normal ocular mucosa.

A. L. Kankrov (1928), who was a proponent of the specific nature of the intracellular inclusions in trachoma, noted the presence of trachomatous inclusions in the conjunctiva under certain conditions even in the absence of the clinical picture of trachoma. He observed that "when trachoma was present in one eye, intracellular inclusions were found in the scrapings of the other, healthy eye." "Could it be certified," he asked, "that their presence there is not the beginning of the disease, which has not yet manifested itself in any way?" (quoted by V. V. Chirkovskiy, *Vestnik Oftalmologii*, 1950, No. 3).

In her work (at the Trachoma Institute at Ashkhabad, devoted to the specificity of the Prowazek bodies in trachoma) Gorbunova pointed out that acute epidemic conjunctivitis produced by the Koch-Weeks, Morax-Axenfeld bacilli, and others were accompanied

in 13.7 percent of the cases by the appearance of the intracellular inclusions of Prowazek (quoted by V. V. Chirkovskiy, *Vestnik Oftalmologii*, 1950, No. 3). However, she did not report whether or not the clinical picture of trachoma developed after the conjunctivitis was cured. If not, then it is possible that in the given cases virus carriage existed, and the conjunctivitis exerted a provocative influence on the appearance of the Prowazek bodies.

Izabolinskiy and V. I. Spasskiy also speak of the presence of Prowazek bodies in the normal conjunctiva.

P. N. Zhurin (1951) examined 51 healthy eyes in 43 persons; of these, 27 persons had trachoma in only 1 eye. Prowazek bodies were found in conjunctival scrapings of five healthy eyes in five persons who had a disease in the other eye suspected of being trachoma, and in which Prowazek bodies were present.

The day after the Prowazek bodies were found, the healthy eyes became diseased in all cases, and after 2 days, a clinical, acute conjunctivitis developed, followed later by typical trachoma in both eyes. The author believes that the Prowazek bodies were found by him in the last few days of incubation, although this contradicts the data of Miyashita, who after an artificial transplantation of trachoma from person to person did not find Prowazek bodies in the incubation period.

Of the foreign authors, Bodian (1947) reported that out of 100 Fiji natives working for the American Army, signs of trachoma were found in 22 clinically. In 15 of these 22 persons, typical Prowazek bodies were found in the epithelial cells. Of 78 persons who did not have clinical signs of trachoma, 27 had inclusions morphologically identical with the inclusions found in the trachoma patients. Transmissibility and pathogenicity of the trachoma virus in these persons were not proved by the author, nor were the results of further observation of them described.

It is known that Prowazek inclusions are found most often in fresh trachoma or even in the prefollicular stage (Grosfel'd, G. Kh. Kudoyarov, and others) as well as in untreated trachoma. After treatment, they disappear or are found with great difficulty, and after therapy is stopped they can be demonstrated again.

In cicatricial trachoma they are very rarely found (V. P. Odintsov).

At the suggestion of V. V. Chirkovskiy (1953), trachoma in which the cicatrization of the conjunctiva has been completed, with no hyperemia or infiltration, is distinguished as stage 4 (absolute trachoma).

"Separation of the fourth period of trachoma into a special clinical form," writes V. V. Chirkovskiy, "is expedient for the purpose of characterizing the conclusion of the process, although, in essence, it is the same, third period of trachoma, the cicatricial. Establishment of its presence is important also in an epidemiological connection, because this period, in contrast to the others, is considered noninfectious by us."

Later, he mentions "that by the fourth period we understand not only those resultant forms of trachomatous inflammation where there is diffuse terminal cicatrization of the lids but also those cases where the trachoma has been concluded with the formation of individual scars, even though hardly noticeable, but where the conjunctiva does not show inflammatory signs."

According to the data of A. L. Kankrov (1928), in cicatricial trachoma (it must be assumed that this is the fourth stage, according to the modern classification) Prowazek bodies are rarely found.

In the literature available to us in recent years we have not been able to find any reports of investigations of Prowazek bodies in the fourth stage of trachoma.

In his work at the Chuvash Trachoma Institute, 1951, devoted to the problem of Prowazek bodies, P. N. Zhurin examined 1,039 trachoma patients admitted for the first time and in stages 1, 2, and 3, but apparently no investigations were carried out for Prowazek bodies in stage 4 trachoma patients.

From November 1952 through December 1954 the Izhevsk Medical Institute eye disease clinic examined 11 inhabited places with the aim of demonstrating Prowazek bodies both in trachoma patients and in clinically healthy persons. Trachoma patients in each of the four stages, persons suspected of trachoma, those with follicular and catarrhal conjunctivitis, as well as persons with clinically healthy palpebral conjunctivae were included.

For each inhabited place a special examination journal was kept on the type of the family-homestead list card. Each journal sheet was designed for a single family.

In order to obtain a surface scraping of the conjunctiva, the upper lid of the eye under examination was everted on a lid elevator, and in cases where the conjunctiva was contracted, even without the aid of the lid elevator, a conjunctival scraping was taken with a dull scalpel from the area of the upper edge of the cartilage and the plica semilunaris (superior fornix). In certain cases, depending on the picture of involvement of the conjunctiva, the scrapings were taken from the plica semilunaris of the lower lid [inferior fornix]. The material obtained was spread out on a glass slide. From the material taken from each eye a single preparation was made. The scrapings were examined in the clinic laboratory. They were stained by the Romanowsky-Giemsa method, without fixation.

We classified the Prowazek bodies in groups as typical or atypical. Bodies with definite granulation in the form of caps around the nucleus of the epithelial cell belonged to the typical group. With respect to number, the bodies detected were classified as multiple, when there were two to three or more bodies in the microscopic field or in the preparation (in three patients with stage 4 trachoma there were three to four bodies in the microscopic field), and single, when after prolonged search only one or two Prowazek bodies were found in the preparation.

Prowazek bodies were considered atypical in which the granulation existed in the form of compact granular clumps disposed near the nucleus of the cell, or in cases of those bodies which were found in a stage of lysis.

P. N. Zhurin believes that "at the present time all the so-called atypical inclusions cannot be regarded as nonspecific substances, and one cannot avoid studying them and taking them into consideration in the evaluation of the problem of the etiologiical role of Prowazek inclusions."

We examined scrapings for Prowazek-Halberstaedter bodies in 2,933 persons. Of these, there were 53 persons suspected of trachoma, 13 with stage 1 trachoma, 19 with stage 2

trachoma, 491 with stage 3 trachoma, and 795 with stage 4 trachoma, 151 with catarrhal conjunctivitis, subacute and chronic, and 114 with follicular conjunctivitis. There were 1,297 clinically healthy persons.

On examination of the scrapings, Prowazek bodies were found in 3.8 percent of the persons suspected of trachoma. In patients who had trachoma they were found as follows: stage 1, in 23 percent; stage 2, 10.5 percent; stage 3, 9.49 percent; and stage 4, 4 percent. They were found in 0.7 percent of patients with catarrhal conjunctivitis, in 1.8 percent with follicular conjunctivitis, and in 1 percent of clinically healthy persons.

If account is also taken of the atypical Prowazek bodies found, the percentage of positive results is increased in all patients with the exception of the persons suspected of having trachoma and patients with stage 1 trachoma. The percentage of atypical bodies compared with typical ones was particularly high in clinically healthy persons: typical, 1 percent; atypical, 1.85 percent; together, 2.9 percent.

Of the 795 patients with stage 4 trachoma, 249 had been spontaneously cured, 271 had been treated in early childhood, 158 had been treated at intervals, and 117 had received systematic treatment.

Of the group of patients with stage 4 trachoma, antirolapse treatment had been conducted in only 168: of these, typical Prowazek bodies were found in 4 persons (2.4 percent). Of the 627 patients who had not received antirolapse treatment, there were more with typical Prowazek bodies, 4.55 percent. In the great majority of patients single Prowazek bodies were found, including those who had had a spontaneous cure, those treated in early childhood, those treated at intervals, and those treated systematically.

As had already been mentioned, of the 1,297 clinically healthy persons typical Prowazek bodies were found in 13 (1 percent); atypical ones, in 24 (1.8 percent). We wanted to clarify whether or not there was a difference in the percentage of Prowazek bodies found in contacts and in those who had not had contact with the disease. There was practically no difference—2.5 and 3.2 percent, respectively.

Data of an ordinary clinical examination with

the naked eye, or sometimes with the aid of a binocular magnifying glass, make it possible to decide that the trachomatous process had been concluded; nevertheless, as has now been established, foci of still-smoldering infection are found in a significant portion of the cases when they are examined by means of a slit lamp (N. Ya. Pokhisov, K. I. Golubeva, T. I. Voinova, T. D. Zatssepina, and others).

In order to clarify whether a state of cure of the trachomatous process existed, we (F. F. Sysoyev, N. T. Novoselova) checked 73 patients with stage 4 trachoma who were under the observation of the polyclinic group of the eye clinic. Examination was made of the conjunctiva and cornea by means of the slit lamp, and scrapings were taken for Prowazek bodies. In one of this group of patients the diagnosis of stage 4 trachoma was not confirmed by the slit lamp examination. No changes were found in the conjunctiva or cornea. He was healthy. No Prowazek bodies were found on two examinations of scrapings. There was no one who had trachoma in the family. In the other 72 patients, slit lamp examinations and examinations of scrapings were conducted once in 38, twice in 25, 3 times in 8, and 4 times in 1 patient.

In 30 trachoma patients complete cure had not occurred, and pathological elements were found in the form of small focal infiltrations and solitary follicles deeply situated in the tarsal conjunctiva. Of the patients in this group, Prowazek bodies were found in two. Often, cases were noted where the trachomatous process proved to be terminated in the conjunctiva of the lower lids, while there were elements of unhealed trachoma on the conjunctiva of the upper lids.

On repeated examinations of 30 patients with stage 3 trachoma no particular changes were noted in the clinical picture: the focal infiltration did not decrease, and the deep-seated follicles were not absorbed (6 months of observation). Stage 3 trachoma passed into stage 4 trachoma in only 1 patient.

Of 42 patients examined by the method of biomicroscopy, Prowazek bodies were found in 1.

Regressive or cicatricial pannuses of varying degrees of activity were found in all patients on examination with the slit lamp.

As has already been mentioned, out of the 2,933 persons, stage 4 trachoma was established in 795 by an ordinary examination, and Prowazek bodies were found in 45 of the 795 persons. Forty-three patients in whom there were Prowazek bodies were checked by the slit lamp at various periods after the first examination (6 to 24 months); of these, the trachoma remained unhealed in 19. Just as in the preceding group, small focal infiltration and solitary, deeply seated follicles were found in the tarsal conjunctiva (stage 3). Of the patients in this group, Prowazek bodies were found repeatedly in five.

Twenty-two persons proved by slit lamp examinations to be cured. Prowazek bodies were found repeatedly in two persons; two others had no signs of having had trachoma (healthy).

Therefore, of 116 patients in whom stage 4 trachoma had been established by the usual methods of examination, unhealed trachoma was found in 49 with the aid of the slit lamp; Prowazek bodies were found both in the unhealed and in the healed (convalescent carriage) cases.

Thirty-six persons who were clinically healthy but had Prowazek bodies were checked with the slit lamp; 17 proved to be completely healthy, 13 had stage 4 microtrachoma [very small trachomatous area], and there was 1 patient each with stage 4 trachoma, with follicular conjunctivitis, with folliculosis, with stage 3 microtrachoma, and with stage 3 trachoma. One was not accounted for.

Prowazek bodies were found repeatedly in two of the group of biomicroscopically healthy persons.

Two persons were checked for follicular conjunctivitis: in one a follicular conjunctivitis was shown; in the other, a *forme fruste* of trachoma. Of two patients with chronic conjunctivitis both proved to be healthy [with respect to trachoma]; in those with acute conjunctivitis, one proved to be healthy. In these patients it was impossible to find Prowazek bodies in repeated scrapings.

As has been mentioned, typical Prowazek bodies were found in 13 clinically healthy persons. On slit lamp examination, six persons of this group were shown to have healthy conjunctivae, while Prowazek bodies were found re-

which not only treatment of the trachoma patients remaining and prophylactic work will be carried out, but where also kolkhozniks will receive other forms of medical aid within the limits of competency of the nurse. Thus, gradually, with the elimination of trachoma, the trachoma stations should be reorganized as kolkhoz medical stations.

### Conclusions

1. After establishment of the existence of stage 4 trachoma by ordinary methods of investigation, elements of unhealed trachoma remain in almost half of the patients in the form of small focal infiltrations and solitary follicles deeply situated in the tarsal conjunctiva or at the corners of the cartilages (stage 3).

2. Prowazek bodies are found even in those in whom the diagnosis of healed trachoma had been established biomicroscopically (convalescent carriage), which is of epidemiological significance.

3. In foci of trachoma the possibility of carriage of it by persons who are clinically completely healthy has not been excluded.

4. Patients with the so-called *forme fruste* of trachoma, latent trachoma, and microtrachoma are often recorded as healthy in ordinary examinations, but in practice are virus carriers. Therefore, the possibility of infection from them has not been excluded. Under certain conditions, the characteristic clinical picture of the disease can develop in them, diagnosable even by ordinary methods of examinations.

5. The criterion of the state of cure of trachoma, that is of complete safety for those around with a guarantee against relapses, has not as yet been established. Therefore, at the current stage of the fight against trachoma, registration and account of the healed cases (stage 4) and constant observation of them are obligatory, and antirelapse therapy is desirable.

6. The period of 4 to 6 months established for observation of the healed cases (stage 4) should be considered arbitrary. Systematic observation of them should be carried out without definition of periods of time.

7. In view of the relapses observed in those who have been cured, the trachoma (medical) stations in the trachoma foci should be maintained for a certain time even in the event all the patients are cured.

## Grants for Evaluating Glaucoma Diagnosis Techniques

A 5-year study to evaluate methods for screening and diagnosing glaucoma in the United States has been launched with the financial support of the Public Health Service's National Institutes of Health.

Techniques currently applied to the detection and identification of glaucoma are now being evaluated at four research centers in this country through grants awarded by the National Institute of Neurological Diseases and Blindness. The grants are expected to total approximately \$115,000 a year.

The grantees are the Wilmer Institute, Johns Hopkins University Hospital, Baltimore; Moffitt Eye Hospital, University of California Medical School, San Francisco; Department of Ophthalmology, Washington University School of Medicine, St. Louis; and the Department of Ophthalmology, State University of Iowa, Iowa City.

The cause of the disease is unknown. Early detection might allow saving the patient's eyesight, but diagnosis in early stages is difficult because the patient often feels no discomfort. Since glaucoma appears to be a family disease, a large proportion of individuals studied will be children of glaucoma patients.

A statistical analysis of the study data is planned by the Chronic Disease Branch of the Service's Bureau of State Services.

## STATEMENT

*By Arthur S. Flemming, Secretary of Health,  
Education, and Welfare, April 20, 1959*

# Accidental Poisoning

I want to call to public attention, and particularly to the attention of parents, data on accidental poisoning received by the National Clearinghouse for Poison Control Centers.

The clearinghouse, established in Washington by the Public Health Service in 1957, has now completed an analysis of 4,000 cases which came to the attention of local poison control centers between July 1956 and April 1958. Ninety percent of the cases analyzed involved children and were typical of the accidents that account for almost 500 child deaths and an estimated 600,000 nonfatal poisonings of children annually.

Children under 5 years of age represented 86 percent of the cases analyzed, the largest number being 1 or 2 years old. A study of the causes clearly indicates that American adults are not taking adequate precautions to protect children in a society that uses over 250,000 different kinds of drugs and household products, many of which are potential killers if misused.

A growing number of communities are establishing poison control centers to cope with poisoning problems. The first center was organized in Chicago in 1953 with support of the American Academy of Pediatrics. There were 130 centers in 1957, and today there are 260 operating in 42 States and the District of Columbia. (States that have no poison control centers listed with the national clearinghouse are: Rhode Island, Vermont, Louisiana, Nevada, Wyoming, Montana, Idaho, and Maine.) The centers maintain records of ingredients of trade-name products plus antidotes. This information is available to physicians by telephone day or night. Parents who call the

centers are given first-aid instructions and advised to call their doctor.

In 85 percent of the cases analyzed by the clearinghouse, children were under the supervision of a parent at the time the accident occurred; 10 percent were being cared for by other adults; and only 5 percent had been left in the charge of other children. How even a few minutes' negligence can cause tragedy is illustrated by the following cases:

A mother who left a can of cleaning fluid on the kitchen table while she answered the telephone returned to find her 2-year-old child had swallowed the fatal fluid. A grandfather put kerosene into an empty coffee can and was using it to clean car parts. While he turned his back briefly, his 16-month-old grandchild swallowed a small amount and died 9 hours later.

Evidence that the toxicity of common products is not generally recognized is the fact that many parents delay hours and even days in seeking treatment for children whom they know have swallowed drugs or household products.

For example, one of the fatalities, an 18-month-old child who swallowed iron sulfate pills prescribed for his parent received no medical attention until 2 days later. A delay of 6 hours in seeking medical care proved fatal for a 2-year-old child who swallowed a few grains of a cornmeal-sugar-rat poison mixture. The mother had put the mixture on the floor late at night and swept it up in the morning, but enough grains remained to kill the child.

Aspirin tops the accident list, accounting for a fourth of the cases studied, most of them small children who swallowed candied aspirin.

Prompt stomach pumping prevented serious consequences in most of these cases and there was only 1 aspirin fatality—a 2-year-old child who swallowed 35 tablets and died a day later despite prompt hospitalization and treatment.

Bleaches, detergents, soaps, water softeners, waxes, polishes, lighter fluids, cosmetics, insecticides, and herbicides as well as all types of medicines and drugs were among the products cited in the study as causing accidents of varying degrees of severity.

The three principal circumstances under which these products proved dangerous were: they were in old bottles or food cans instead of their original containers; they were not in their usual storage place; the storage place was not locked and was in reach of the child.

The place the accidents most frequently occurred were: the kitchen (41 percent of all cases); the bedroom (21 percent); and the bathroom (12 percent).

Most accidental poisoning could be avoided if parents of preschool children kept all products either under lock or out of reaching and climbing distance. Many serious consequences of poisoning could be prevented if parents called physicians promptly, without waiting for symptoms to appear.

### **Poison Control Centers**

Most poison control centers are located in hospitals and maintain 24-hour telephone service, providing private physicians with information about the ingredients of trade-name products, antidotes, and other treatment. In most centers, inquiries are answered by a physician; nurses, pharmacists, or public health sanitarians handle inquiries in some; only 3 percent depend on clerks to relay information from the poison index cards which all of the centers maintain.

Emergency treatment is given in some cen-

ters, but their primary purpose is to furnish information to physicians. If a nonmedical person calls a center, he is given first-aid instruction and advised to call his physician.

The principal supporters of centers are State chapters of the American Academy of Pediatrics, State and city health departments, medical schools, and local medical societies. Some are also financed by parent-teacher associations and men's and women's service clubs. Frequently a number of organizations join together to provide financial aid, office space, personnel, and supplies. Children's Bureau grants-in-aid to State health departments also help to support some centers.

### **National Clearinghouse for Poison Control**

The National Clearinghouse for Poison Control Centers serves local centers by providing information on new products which it obtains through a voluntary arrangement with manufacturers. Over 200 major producers of drugs and household products inform the clearinghouse of the ingredients their products contain and the antidotes for them. Since there is no law requiring that the ingredients of some of these products be printed on their labels—data which physicians must have in order to give proper treatment—the card indexes which the clearinghouse supplies to all centers are the chief source for such information.

The clearinghouse also receives reports of any new poison hazard discovered by any of the local centers and forwards the information to all other centers.

Additional activities of the clearinghouse include assistance to communities that wish to establish poison control centers, issuance of a monthly newsletter, tabulation and analysis of poison cases reported by the centers, and research.

# Federal Publications

**The Aged and the Aging in the United States.** *Hearings Before the Subcommittee on Problems of the Aged and Aging of the Committee on Labor and Public Welfare, United States Senate; 1959; 313 pages.*

Statements and discussions by 22 expert consultants cover the health of the aged and aging; employment problems of the older worker and mandatory retirement; income maintenance and financing of medical care; and housing, living arrangements, and social services. Additional information includes reports, summaries of proposed legislation, 8 tables, and 10 charts.

Copies may be obtained by writing to Senator Pat McNamara, Chairman, Subcommittee on Problems of the Aged and Aging, United States Senate, Old Senate Office Building, Room 240, Washington 25, D.C.

**The Dental Service Corporation in a Public Assistance Program.** *PHS Publication No. 680; 1959; 50 pages.*

The dental care program of the Washington State Department of Public Assistance and its administration by the Washington State Dental Service Corporation are described. History, financing, eligibility and priorities for treatment, and dental fee schedules are discussed in detail.

Included in the appendix are copies of contracts between the corporation and the department and a complete set of tables covering the corporation's service for 1 year.

**Health Manpower Source Book.** Physicians, dentists, and professional nurses. *PHS Publication No. 263, Section 9; 1959; 80 pages; 50 cents.*

State, regional, and national data reveal trends in education, location, and specialization. They have been selected to provide background information for persons and organizations concerned with providing

health services and planning for the education of health personnel.

Tabulations relate to the 48 States and the District of Columbia except as otherwise indicated. Materials used in their compilation are identified on each table. Estimates to compensate for gaps in knowledge and to project findings to the future are included.

**Health Statistics From the U.S. National Health Survey.** Children and youth, selected health characteristics. *United States, July 1957-June 1958. PHS Publication No. 584-C1; 1959; 48 pages; 35 cents.*

The first of a new series which will carry health interview survey results for population groups, this report presents statistics on a variety of health topics among persons under 25 years of age.

Summary information is presented on acute conditions, persons injured, impairments, limitation of activity and mobility, disability days, hospital discharges, visits to the dentist and physician, and population estimates.

**Arthropod-Borne Encephalitis.** Procedures for investigating outbreaks. *PHS Publication No. 674; 1959; by Roy W. Chamberlain; 27 pages; 20 cents.*

Directed to doctors, veterinarians, and biologists, this field guide emphasizes obtaining materials for laboratory study. Instructions and lists of equipment are given for collecting and handling specimens from humans, horses, birds, and mosquitoes.

**Staphylococcal Disease.** A guide for organizing hospital inservice training programs. *PHS Publication No. 692; 1959; 15 pages; 30 cents.*

Directed to persons responsible for developing training courses for prevention and control of staphylococcal disease in hospitals, the suggested curriculum should be useful

also in helping to resolve other infectious disease problems in patient-care institutions.

Establishing a training committee, developing and maintaining a program, and course content for various personnel categories are discussed. A list of training aids is included.

**Public Health Aspects of Increasing Tetraethyl Lead Content in Motor Fuel.** *PHS Publication No. 712; 1959; 49 pages; 30 cents.*

The report of the Advisory Committee on Tetraethyl Lead to the Surgeon General of the Public Health Service is presented. Information on the consumption of tetraethyl lead, health and environmental data, and statements on the technical and hygienic aspects of increasing the tetraethyl lead content of gasoline from the present maximum of 3 cubic centimeters to a new maximum of 4 cubic centimeters per gallon are included.

Proposed regulations from an earlier Public Health Service publication on the use of tetraethyl lead in gasoline appear in the appendix.

**Speaking of Prepaid Dental Care.** A glossary of terms. *PHS Publication No. 679; 1959; 25 pages.*

Definitions for nearly 200 terms are given in this pamphlet designed primarily for persons interested in developing dental prepayment programs.

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This section carries announcements of new publications prepared by the Public Health Service and of selected publications prepared with Federal support.

Unless otherwise indicated, publications for which prices are quoted are for sale by the Superintendent of Documents, U.S. Government Printing Office, Washington 25, D.C. Orders should be accompanied by cash, check, or money order and should fully identify the publication. Public Health Service publications which do not carry price quotations, as well as single sample copies of those for which prices are shown, can be obtained without charge from the Public Inquiries Branch, Office of Information, Public Health Service, Washington 25, D.C.

The Public Health Service does not supply publications other than its own.

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## THE INCIDENCE OF ILLNESS IN A GENERAL POPULATION GROUP

General Results of a Morbidity Study from December 1, 1921, Through March 31, 1924, in Hagerstown, Md.<sup>1</sup>

By EDGAR SYDENSTRICKER, Statistician, United States Public Health Service

The problems and aims of public health are still set forth almost entirely in lethal terms whenever statistics are used. We speak of an unfavorable death rate and measure success in a lowered mortality. The best indices which have been available of the prevalence of nearly all diseases are the fatal cases only; and our epidemiology is limited, for the most part, to statistics of deaths.

The reasons for this condition are fairly clear to every vital statistician and will not be discussed here. Of greater pertinence is the result of a prolonged dependence upon mortality statistics. The effect has been to foster a fallacious premise for public health work, namely, that a low death rate indicates the presence of health. Obviously it does not. We know that, on the contrary, an exceedingly unhealthy region may exhibit a relatively low mortality, as, for example, a heavily infested hookworm locality or a section abounding in malaria. Pellagra may be widely prevalent in a community without affecting perceptibly its general death rate or even increasing materially the number of deaths from the disease itself. Instances of the same sort could be multiplied. The ill health that is manifested in symptoms, in discomfort, in lessened vigor and efficiency, even in illness and suffering, is not reflected in the death rate, except for certain diseases, for any purpose practicable in preventive work.

FEBRUARY 13, 1925, pp. 279-291

Edgar Sydenstricker's summary of provisional results of the first household survey by the Public Health Service in Hagerstown, Md., lit the path for the use of morbidity data about the Nation's population, in addition to mortality data.

# Governmental Aspects of Sanitation in the Urban Fringe

FLOYD B. TAYLOR, M.P.H.

THE PUBLIC HEALTH engineer in the State or local health department is in a position to assume leadership in attacking the sanitary engineering problems of metropolitan or urban development. As so many of these problems concern the environment, a field in which he has professional competence, it is natural that he provide guidance and stimulation in obtaining for urban dwellers adequate water supply, sewerage, housing, health department inspection services, and other public health measures.

The public health engineer may be highly proficient in the technical aspects of sanitary engineering. However, in the nonsanitary engineering phases of urban area work, such as planning, economics, and governmental relationships, he is often in need of counsel. At a conference held by the Public Health Service in January 1958, the consensus was that the technical aspects of urban area sanitary engineering were becoming known but that the non-technical phases, such as governmental relationships and economics, were not well known and needed to be better understood by the worker in this field. It is upon these phases that progress in solving urban area problems hinges.

A case in point is found in the work of the Joint Legislative Committee on Metropolitan Area Study to the Legislature of the State of New York. In their appraisal of metropolitan problems in that State, water supply occupied

a prominent place. It was stated that planning, economics, and governmental arrangements were of more consequence than engineering solutions to the problem. They said: "Answers to these problems in a metropolitan area almost invariably entail governmental adjustments and working relations among various political subdivisions which are not in every instance readily achieved. Waterworks engineers have complicated formulas for measuring 'friction loss' in the velocity of water delivered through mains. There is also 'friction loss' in arriving at satisfactory governmental arrangements for water supply and distribution in metropolitan centers" (1).

The material which follows on the relationship of government to the urban fringe is intended to aid the public health worker by presenting the fundamentals of governmental relationships. References are given for further study. A question that may well be asked is, what place does a sanitary engineer have in establishing any governmental arrangement or change thereof? The answer is that although he does not usually have a direct role in shaping political circumstances, he may be influential in political decisions and he also may be, and frequently is, instrumental in obtaining the enactment of legislation. He may also be instrumental in obtaining cooperation between separate governmental groups. At the local level the public health engineer can become acquainted with the fundamentals of the governmental arrangement under which he works and the potential use of other arrangements. He can be thoroughly familiar with the purpose and content of various ordinances such as

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*Mr. Taylor serves as chief of the Special Studies Unit in the Technical Services Section of the General Engineering Branch, Public Health Service.*

those that regulate housing, zoning, and subdivisions. At the State level he should be aware of all permissive and regulatory statutes which in any way affect the provision of sanitary engineering services to the urban area. This is also true of the worker at the Federal level.

## Fundamentals

The relationship of government to urban fringe sanitation problems is best viewed in the light of the excellent fundamental concepts of government under which Americans live. These are that government has three functions: legislative, executive, and judicial. These three are closely bound together and interwoven, yet each is an entity.

Legislation is required to establish the legal framework within which urban area problems can be attacked. It is the medium for expressing the will of the people. Legislation is needed at the State level to authorize the use of local forms of urban area government as the State has sovereign power over the municipalities within its borders. Local ordinances are required to permit the adoption of governmental forms.

From the legislative proceedings stem the executive arrangements under which the method of choice or use is administered. These arrangements vary with the form used and will be discussed below.

Court action on contested legislation or executive decisions shape the plans chosen to deal with subsequent problems or in designing a new approach to solving a problem by the means first selected.

It must be recognized that urban fringe sanitation problems are a part of a larger problem of which the solution is primarily political. Hence the importance of understanding governmental functions. This larger problem is that of coordinating the actions of fragmented government—in 1957 there were in the United States more than 102,000 units of government (2)—operating in an area of such population density that political boundary lines do not contain the common needs of the people. Besides sanitation requirements there are the common needs of transportation, highways, schools, hospitals, fire and police protection, and storm

drainage. Sanitation requirements include water supply, sewage disposal, refuse collection and disposal, and health department inspection services in such categories as milk and food supply and service, radiation, and nuisances.

## Governmental Arrangements

In the United States the following governmental arrangements have been used in recent years, singly or in combination, in dealing with urban fringe problems (3): annexation; extension of central city services; transfer of functions; special districts or authorities, single service and multiservice; city-county consolidation; incorporation; and mutual cooperation.

Definitions of these follow, along with a brief, tabulated description of the conditions which are favorable to a particular method, some of its advantages and disadvantages, and some locations where it has been used. The advantages and disadvantages pertain to the method described and are not necessarily considered from an overall standpoint such as the comparison of one method with another.

### *Annexation*

Annexation is the acquiring by a governmental unit of additional territory adjacent to and outside its political boundaries. In practice it means moving a municipal boundary line to encompass more land. Sometimes a pocket of land called an enclave, entirely within a city boundary, but not a part of the city, is annexed (4).

#### CONDITIONS FAVORABLE TO THE METHOD

The area outside the core city should have no incorporated municipalities and must be immediately adjacent to the city boundaries.

#### ADVANTAGES

Total area subject to city taxes will increase.

Lowers cost of municipal services for annexed areas. City may receive larger share of State sales and gasoline taxes.

City codes may uplift housing face of surrounding area.

Prevents further fragmentation of government.

#### DISADVANTAGES

Promotes incorporation of unincorporated areas outside core city.

City may suffer a "net tax loss" if it has to provide

services at existing city rates and at increased cost caused by expansion of equipment and facilities.

Usually inapplicable where urban area crosses a county line and not at all where it crosses a State line.

Annexation laws may be difficult to use.

Seldom takes in the entire fringe so the problem may continue though smaller in area.

#### SOME PLACES WHERE USED

Mesa, Ariz., Milwaukee, Wis., Fairfax, Va., Alexandria, Va., Dallas, Tex., Kansas City, Mo., Louisville, Ky., Roanoke, Va., Tampa, Fla., Seattle, Wash., Wichita, Kans., Atlanta, Ga., Madison, Wis.

#### *Extension of Central City Services*

Extension of central city services refers to the core city's extension, usually through contract agreement with outlying areas or communities, of its water mains, acceptance of incoming sewerlines, or allowing use of its incinerator or sanitary landfill for disposal of refuse.

#### CONDITIONS FAVORABLE TO THE METHOD

Central city services, especially the waterworks, sewage disposal plant, or incinerator are of adequate capacity.

A definite limit can be set beyond which the city will not be expected to furnish services.

Adequate time for farsighted planning is available.

State statutes do not hinder effectiveness of this form of providing services.

#### ADVANTAGES

Do not need to build additional plants in outlying areas.

Do not need to set up another administrative and legal structure of government for outlying areas to handle sanitary services.

Urban dwellers avoid capital financing problems.

#### DISADVANTAGES

Many cities do not have adequate facility capacity for this method.

As existing systems tend to become smaller as they recede from the plant, it may be necessary to construct new water mains and trunk sewers with resultant high cost.

The suburb is completely dependent upon city for services without having a voice in their administration.

#### SOME PLACES WHERE USED

Grand Rapids, Mich., Auburn, Maine, Peekskill, N.Y., Bloomsburg, Pa., Aurora, Ill., Atlanta, Ga., Fort Worth, Tex., Rochester, Buffalo, and Syracuse, N.Y.

#### *Transfer of Functions*

In transfer of functions existing incorporated communities or State legislatures assign the

right and responsibility of providing services or functions, such as water supply and sewerage, to another order of government, frequently higher, such as the county. Transfer of functions may also occur laterally, that is from one community to another.

#### CONDITIONS FAVORABLE TO THE METHOD

A number of incorporated communities which will not consolidate politically.

An efficient functional operation at the level of government to which the transfer is made.

#### ADVANTAGES

Larger scale operation may produce more efficiency.

Per capita operating costs are lower due to single administration of operation.

County may be kept as a partner in administering functions common to many municipalities.

Community political boundaries remain intact.

#### DISADVANTAGES

People often fear surrender of any governmental rights from the local level to any other unit of government.

Not easily accomplished where a considerable number of city-type functions are transferred.

#### SOME PLACES WHERE USED

Dade County, Fla. (also called a federation type), and Los Angeles.

#### *Special Districts*

The special district is an independent administrative arrangement endowed with certain specified governmental rights. It may transcend political boundaries, has the power to issue bonds, sometimes to levy taxes, and to contract for construction, but is created for a specific purpose or purposes. It may provide either single or multiple services. It does not have political power of government outside of its specified purpose.

#### CONDITIONS FAVORABLE TO THE METHOD

Legal debt limits are reached in local communities.

Legal authority is granted by State legislation to establish districts.

Impossible to achieve informal cooperation between existing governments.

#### ADVANTAGES

May finance operations from revenue bonds.

Circumvents legal debt and tax limits.

Does not change any existing political boundaries.

Can be highly efficient.

Authority bonds may pledge only expected income and not property as security.

## DISADVANTAGES

Authority bonds may carry higher interest rates.

Authority may grow to the point where it is non-responsive to the desires of the people it serves.

Adds another unit of government to existing maze.

When a revenue-producing function is given to an authority, existing governments lose that revenue.

## SOME PLACES WHERE USED

North Jersey Water District; Washington Suburban Sanitary Commission (Md.); Allegheny County, Pa.; Sanitary Authority, Louisville-Jefferson County, Ky.; St. Louis, Mo.; Boston Metropolitan District; Passaic Valley Sewage District, Newark, N.J.; Akron Metropolitan Housing Authority, Akron, Ohio; Hampton Roads Sanitation District, Norfolk, Va.; Greater Greenville Sewer District, Greenville, N.C.

### *City-County Consolidation*

The arrangement called city-county consolidation consists of constituting the county or the city as the single administrative, legal center for providing the essential common services and government required by urban dwellers. Neither city nor county completely loses its identity.

## CONDITIONS FAVORABLE TO THE METHOD

A large city occupying most of the area of the county.

Equity in the relationship between city and county. Action required due to expanded functions of both units in the same geographic area.

## ADVANTAGES

Substantially eliminates dual governments.

Urban dwellers obtain services under one management.

Regarded by political scientists as one of the best answers to governmental difficulties.

## DISADVANTAGES

Difficult to put into effect because of required State legislation.

Suburban dwellers fear they may be absorbed by the central city and fear assumption of added costs.

Not the answer where an urban area of more than one county is involved, also not the ultimate answer as urban areas cross county lines.

## SOME PLACES WHERE USED

Philadelphia, Pa.; Boston, Mass.; New Orleans, La.; Baton Rouge, La.; New York, N.Y. (In recent years, only Baton Rouge in 1949.)

### *Incorporation*

Incorporation is the establishment of a political unit of government with geographic bound-

aries in an unincorporated area, for a closely settled population.

## CONDITIONS FAVORABLE TO THE METHOD

An unincorporated area of good size containing population densities of at least 2,200 per square mile.

Economic level of area is high enough to produce the tax base needed to finance the government and its functions.

## ADVANTAGES

Resists city annexation.

Retains rights of the individual citizen.

Enables a group of citizens to establish tax basis for funds to provide services they desire.

## DISADVANTAGES

Urban dwellers will probably pay higher taxes.

Taxes collected may not be adequate to finance improvements with result that services are ultimately inadequate.

May hinder the overall development of the area.

## SOME PLACES WHERE USED

Dallas County, Tex.; Du Page County, Ill.; St. Louis County, Mo. Widely practiced except in the New England States.

### *Mutual Cooperation*

Mutual cooperation is not a form of government. It is the working together of people in existing incorporated places with groups of people in unincorporated areas or with each other, within the existing legal framework, to accomplish the job of providing to all urban dwellers the common services they require.

## CONDITIONS FAVORABLE TO THE METHOD

Legal obstacles to other forms.

The prior failure of other forms.

A spirit of cooperation among the people.

## ADVANTAGES

Can function within existing legal framework.

No other layer of government is established.

No new taxes are imposed.

Possibly the best of all methods.

## DISADVANTAGES

Inherent difficulty of getting groups of citizens to work together.

## SOME PLACES WHERE USED

Tulsa, Okla.; Fairfax County, Va.; Metropolitan Area Regional Conference, Washington, D.C.; Salem, Oreg.; Los Angeles, Calif.

There has appeared on the North American continent another form known as federation. So far its use has been only in Toronto, Canada,

and in a modified version it has recently been established in the Montreal area. The Dade County, Fla., venture is sometimes called federation and some times functional transfer, under which it has been listed.

Under this system a new metropolitan government is established which generally has the territorial jurisdiction of the total of that of the lower orders of government. The lower orders of government continue in existence and have control over local functions. This method is related somewhat to functional transfer but with the important difference that many political rights of individual communities are surrendered to the larger government.

#### CONDITIONS FAVORABLE TO THE METHOD

A muddle of embattled incorporated-unincorporated fringe settlements.

State constitutional authorization can be obtained.

#### ADVANTAGES

Single control increases efficiency of operation.

Per capita cost of services is lower.

Community boundaries remain intact.

#### DISADVANTAGES

Some individual community rights are surrendered to a higher order of government.

Because of its vast size, quality of services may deteriorate due to logistical difficulties.

#### SOME PLACES WHERE USED

Toronto and Montreal.

In choosing, using, or advocating any of these arrangements, careful consideration must be given to three points: there will be resistance to changing any existing governmental pattern; the economics, tax structure, and bond market of any area is a key factor; land use and subdivisions should be carefully regulated.

#### Legislative

Legislation for the accomplishment of municipal government must be established at the State level and ordinances at the local level. Traditionally, the local government has won increasing autonomy from the State which, however, has never entirely relinquished its control over local governmental arrangements. Thus the establishment of a local governmental form is based upon State statute authorizing

this procedure. It is here, therefore, at the State level, that the foundations of the local governmental process are laid. For example, before an authority, annexation procedure, federation, or functional transfer may be established at the local level there must be enabling State legislation. Even the right of contiguous communities to cooperate with each other in providing services is sometimes regulated by State statute.

At the local level, municipal ordinance is invariably required to permit use of any governmental form and to delineate the provisions for administering it. Also State legislation will usually specify or control the administrative or executive procedure used by the local government.

A search was made to determine which States legally sanctioned which types of local governmental forms, and although no central summary was found some generalizations may be made. Many States permit incorporation and annexation under a variety of legal provisions. Among States having legislation authorizing formation of special districts are California, Colorado, Connecticut, Florida, Georgia, Illinois, Indiana, Kansas, Louisiana, Maine, Massachusetts, Michigan, Minnesota, Missouri, Nebraska, New Jersey, Oregon, Ohio, Pennsylvania, South Carolina, Tennessee, Texas, Utah, Virginia, Washington, and Wisconsin.

Constitutional amendments are usually needed to authorize consolidation, federation, or functional transfer, and exist in only a few States. Extension of central city services by contract with outlying areas is legal in many States.

Auxiliary legislative tools needed in coping with metropolitan problems are subdivision regulations (5), zoning ordinances (6), building and housing codes, and health regulations. A model subdivision regulation entitled "Suggested Land Subdivision Regulations" was published in 1952 by the U.S. Housing and Home Finance Agency. Forty-three States have enabling legislation authorizing municipalities and many counties to regulate land subdivision.

Examples of State-level legislation enacted to enable the provision of suburban sewers, one

phase of the urban area sanitation problem, have been described by Richards (?).

Federal legislation affecting urban area problems exists in the form of certain assistance programs. Also a variety of Federal programs of interest to the urban area worker are outlined in the U.S. Department of Commerce publication, "Federal Activities Helpful to Communities."

## Executive

Except for the authority or special district governmental arrangement, the remainder of local forms are administered by traditional methods: commission, council-manager, and mayor-council. The mayor-council form is further described as weak-mayor and council, and strong-mayor and council (8).

These forms of administration have jurisdiction over all functions and responsibilities of the local government. Under them departments or divisions may be established to carry on the day-to-day work of providing the city with services. The department heads, of which the health director or commissioner is one, act as staff to the executive.

## Commission

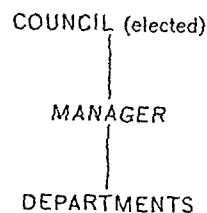
The people elect a commission, each member of which is made responsible for a section of the city governmental functions. The commissioner who received the most votes may be chosen by the commission as mayor. He is frequently made the head of the government and supervises the most important department. The commission may appoint heads of departments to execute their work. An example of the arrangement is shown as follows:



## Council-Manager

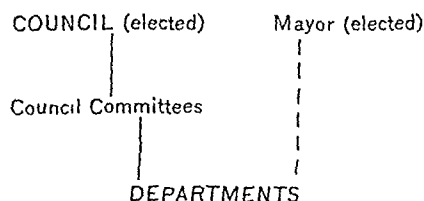
Under the council-manager form the voters elect a council by popular vote. The council employs a professional municipal administrator or manager as its executive in handling the functions of government. He is an appointed,

individual who is subject to dismissal by the council, which retains the basic responsibility for proper discharge of the duties of government.



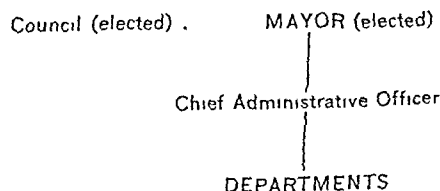
## Weak-Mayor and Council

In the weak-mayor and council form the council and the mayor are each elected by the people. However, the mayor acts in an advisory capacity in matters of administration and is the government's political head. The council, sometimes through a series of committees, actually administers the affairs of the municipality. The council committees in turn run the departments.



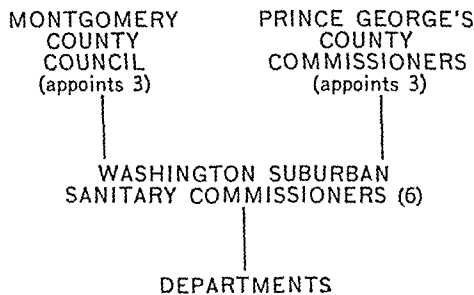
## Strong-Mayor and Council

Again, as in the weak-mayor and council, the people elect a mayor and council but under this form of government the mayor has direct charge of operating city functions. He may employ an executive to do the actual work, and a typical arrangement is as follows:



The various weaknesses and strong points of these forms are not discussed in detail as volumes on the subject have been written by political scientists and opinions differ as to their relative merits (8).

Under the authority or special district plan, an executive mechanism is established which has only specifically stated governmental jurisdiction (9). The administrative responsibility may be single or multiple in coverage. For example, some districts are limited to providing only water supply, and other districts are authorized to administer water, sewerage, and refuse jointly. The governing bodies of special districts or authorities are either elected or appointed. Members of the body, usually odd in number, may be called commissioners, directors, or trustees, and terms of office range from 2 to 6 years. The authority has the power to issue bonds, contract for construction, and collect service charges and sometimes to levy taxes. Dependent upon its size, the authority members may carry out their responsibilities directly, or they may set up a departmentalized administrative structure. An example of the latter is the Washington Suburban Sanitary Commission which has an organizational framework as follows:



### Judicial

An extended consideration of the judicial aspects of the governmental problems in the urban fringe is beyond the limits of this discussion. Court decisions on cases pertaining to the subject are vast in number. In any given locality the worker in the field of urban area sanitation should learn the nature of judicial actions bearing upon his work.

One judicial procedure which varies from the usual is that in Virginia (2). There, since 1904, all annexation petitions are decided upon by a specially appointed circuit court whose judges are selected by the chief justice of the State supreme court of appeals.

A petition action can be accomplished in various ways. A community which desires to annex

land can pass an ordinance citing the need, proposed area for annexation, and the terms. If the people outside a municipality desire to be annexed, a petition may be made by 51 percent of the qualified voters of the area concerned.

Petitions are filed with the county circuit court and a special annexation circuit court is constituted. This court considers a petition on four counts: (a) the need of the community for more land in order to develop, (b) the need for governmental services in the territory to be annexed, (c) the mutuality of interests in the proposed annexed area and the annexing municipality, and (d) the financial ability of the annexing community to discharge its obligations to the residents of the area to be annexed. The court has the power to determine the boundaries of the annexed territory as well as the terms and conditions of the annexation settlement.

In making its decision the court often hears testimony from health officials, planners, and public administrators.

The most consistent use of annexation in this country has been in Virginia.

### Summary

In summary, the governmental aspects of urban fringe sanitation are among the most important. They arise from the American system of the three foundations of government: legislative, executive, and judicial. The public health engineer, though not usually in a political position, should be thoroughly acquainted with these aspects and how to work through them. He also should be prepared to develop legislative measures which will facilitate his work.

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## Signs and Symptoms

An annotated review of medical genetics for 1958, prepared by Dr. Victor McKusick and colleagues, appears in the *Journal of Chronic Diseases*, October 1959. It is planned to repeat the review annually, with a survey of all publications within the calendar year. Dr. McKusick requests that reprints for use in future reviews be addressed to him at the Johns Hopkins Hospital, Baltimore 5, Md.

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The rate of admission to general hospitals in this country has increased by almost 80 percent in the last 20 years, from 56 to 99 admissions per 1,000 population, but the average patient in a general hospital today spends 8.6 days there—a decline of about one-third from the 12.5 average of 20 years ago, the Health Information Foundation reports on the basis of studies by the Public Health Service.

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In the present American population, chronic illness afflicts 21 million persons over the age of 55, according to estimates of the National Health Survey, Public Health Service. Of this number, nearly one-half are limited in their activity, and at least 1 in 10 is unable to work at ordinary tasks.

» »

A Korean physician, Chai Bin Park, received in June 1959 the first doctorate in public health in the field of biostatistics ever given by the University of California. His topic was "Longitudinal Studies of Tuberculosis Patients Registered in Hawaii." A summary of his doctoral dissertation appeared in the December 1959 issue, p. 1108, of *Public Health Reports*.

Home accident prevention is a public health activity in 40 States, reports the Home Safety Inventory of 1958, sponsored by the National Safety Council. Twenty-four States emphasize home accident prevention as part of established programs, and 16 additional States conduct short-term, specific projects in this field.

» »

Fifty victims of strokes each year will be treated completely within their own homes soon after the onset of attack by the Jewish Chronic Disease Hospital in Brooklyn, which has scheduled a 5-year program. Hospitalization may be required for an acute case, but the goal will be to return the patient home and supply all hospital services there. Rehabilitation therapy will begin at once. By starting treatment shortly after the stroke and the resulting impairment occurs, it is hoped that restoration will be supported and the effects of immobilization will be prevented. The validity of home treatment for other chronic illnesses will be evaluated as well. The project is supported by a grant from the National Institutes of Health, Public Health Service.

» »

A 3-year home care pilot project is underway in a rural area of North Carolina. Increased incidence of aged and chronically ill patients in Person County, covering some 20 square miles in the north central section of the State, stimulated the home care plan which is sponsored by the North Carolina State Board of Health and the Public Health Service. There are 11 practicing physicians in the county and one 60-

bed hospital, serving a population of 25,000.

Services now being given to patients in their homes include medical care and consultation, nursing, social service, physical and occupational therapy, health and nutrition education, orthopedic equipment, medicine, and sickroom supplies. Selected residents of all age groups who are chronically ill or disabled are eligible, regardless of financial status, if they possess the potential for self-care and self-support after appropriate restorative services.

» »

The nucleonics industry is debating the Atomic Energy Commission's proposed rule amending its part 20 regulation, "Standards for Protection Against Radiation." The proposed amendment would decrease radiation exposure limits and require new cumulative exposure reports to employees. Complaints state the rule would complicate employee relations, impose unnecessary economic burdens, and seriously discourage industrial use of atomic energy.

Under the proposed changes, total external radiation exposure for any worker over 18 years of age would be limited to an average of 5 rems annually, reduced from 15 rems, with exposure in any one year limited to 12 rems. Maximum permissible concentrations of radioactive substances in air and water would be changed to be consistent with these dose limits. And licensees would be required to give employees a report showing accumulated exposure annually and within 90 days of termination of employment. Employers would also be required to give workers an immediate report of overexposure.

# *approach to ZERO for Tuberculosis*

## **CONFERENCE REPORT**

Poised for a knockout assault on tuberculosis, the Public Health Service and the National Tuberculosis Association last November invited a distinguished panel to advise on use of available resources for accelerating the disease's decline. Meeting at Arden House, Harriman, N.Y., November 29 through December 2, 1959, the consultants listed (p. 105) signaled a dramatic shift in policy and methods of tuberculosis management.

The following statements reflect observations of the views expressed by individual conferees.

### *The Goal*

Tuberculosis can be extinguished as a public health problem. In favored settings, this eventuality is likely relatively soon. The region reaching from Wisconsin to the Pacific Coast already has an average tuberculosis death rate of 4.4 per 100,000, which, compared to a national rate of 40 in 1945, shows how far one large area has come toward eliminating tuberculosis. In a few smaller communities, the

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*This report was prepared in the Division of Public Health Methods of the Office of the Surgeon General and the Division of Special Health Services of the Bureau of State Services, Public Health Service.*

disease has all but disappeared. For the Nation as a whole tuberculosis is a continuing threat, but the termination of this threat to public health is a reasonable social goal.

### *The Means*

To reach this goal, what is needed is a common, popular determination and, in each community, a central responsible authority dedicated to the end that all cases of tuberculosis are treated by chemotherapy, either in public facilities or by private physicians, adequately and for sufficient time, in order to remove the public health hazard.

### *The Time*

If the opportunity to end tuberculosis is not seized now, it may be lost indefinitely. Medications that are effective today must be applied broadly before the tubercle bacillus develops resistance to these drugs. Otherwise, in a susceptible population, the disease may rise again to a point which defies control.

### *The Scope*

It is estimated that in 1956 about 800,000 Americans with tuberculosis needed supervision in the public health interest. About half this number were receiving such supervision.

While there is no entire State that can be said

no longer to have a public health problem in tuberculosis, the disease tends to be concentrated more heavily in a few States and in large cities. Within States and cities, it tends to be concentrated in some areas or neighborhoods. Of the race-sex groups, nonwhite males have the highest death rates, but more than half of all tuberculosis deaths (and nearly half of newly reported cases) occur in white males.

The disease is most frequent in the older population, which was generally exposed to the bacillus in years past. At age 50 today, the chances are about even that a person shows evidence of past infection. At age 80, prior infection is very likely a certainty. However, in white Navy recruits, aged 17 to 20, tested in 1958-59, only 1 in 20 had been infected. Although the rate of infection in young cohorts is very much lower than in older cohorts, about 2,600 new cases, not merely infections but cases, are reported annually in children under 5. And 18 percent of all new cases reported are in those under 25. The general trend toward a shift of tuberculosis deaths, cases, and infection into the older age groups appears to be taking place in all areas of the United States, whether tuberculosis rates are low or high.

The direction of tuberculosis control can be improved by information gained from records such as those recommended by the Working Group on Service Programs of the Public Health Conference on Records and Statistics in *Public Health Reports* April 1959, pp. 364-371. A well-kept case register enhances effective casefinding and treatment of patients with active disease.

Present trends indicate that, as the older population passes on, there will be fewer persons with infection, incurred in the past, that can break down into disease as a result of factors like malnutrition and other stresses. As there are fewer cases to spread infection, the number occurring as a result of new infection will grow progressively less, also. Assuming no disaster, depression, famine, or other tragic event reverses the trend, it is possible that tuberculosis will slowly die without increased effort at repression. But such an assumption is dangerous. Especially when means are at hand to deliver the coup de grace, aggressive action seems indicated.

The challenge is to find and disinfect patients with active disease or persons in a vulnerable category, especially those who once had active disease. This would include those who left hospitals against medical advice or whose treatment was otherwise interrupted, as well as selected patients treated prior to advent of chemotherapy. Although the main target is the reservoir of infection in active cases, known and unknown, special attention should be given persons in certain categories who are infected but do not have infectious disease, especially children entering adolescence and those under 4 years of age.

In view of the high probability of extrapulmonary complications from tuberculous infections in infants, effective chemotherapy for those with positive reactions to tuberculin tests should be prescribed without exception. At the same time, research should continue on the effectiveness of drug treatment in preventing tuberculous disease in other persons at special risk.

### *The Treatment*

In the past few years it has become possible to provide effective medical treatment of tuberculosis to outpatients. Combinations of anti-tuberculosis drugs—applied adequately and without interruption—are capable of reversing infectiousness and curing tuberculosis in most patients. The cost of isoniazid in such treatment is about six cents a week, and other drugs used for combined therapy are not exorbitantly expensive.

Prolonged bed rest is not necessarily important in most cases. For the most part surgery is indicated less than in the past, thanks to the effects of chemotherapy.

Drug treatment of tuberculosis, good as it is, is not a simple matter of prescribing pills which are immediately and completely effective. It implies first the selection of an appropriate regimen, usually a combination of two drugs. The medication must be taken without interruption for many months. There must be determination of the patient's infectiousness at regular intervals, as well as of the activity of his disease. Those who do not improve under the prescribed regimen need a change of drugs, or may need hospitalization.

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## Conference Participants

Dr. Robert J. Anderson, Bertram Black, Dr. Lester Breslow, Dr. Richard M. Burke, Dr. A. W. Dent, Dr. René Dubos, John Egdorf, Kenneth Hamilton, Dr. Herman Hilleboe, Dr. Alexander Langmuir, Mrs. Lucille Petry Leone, Dr. Benjamin D. Paul, Dr. H. McLeod Riggins, Dr. Beryl Roberts, Dr. Joseph L. Robinson, Dr. Joseph B. Stocklen, Dr. William Tucker, and Dr. J. Yerushalmy.

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Drug treatment of tuberculosis patients, as it is presently practiced, often falls short of the best that is available. Hospital patients leave against medical advice; patients at home stop taking drugs or fail to appear for medical appointments; long periods pass without assessment of patients' bacteriological or disease activity status. Because of these and other failures, the full potential of chemotherapy is not realized in a great number of cases.

### *The First Hurdle*

The bacillus can be banished from the human environment if infectious cases are found promptly and treated adequately. All new infections are believed to result from fresh, vigorous tubercle bacilli coughed out by an infectious person. Usually infections occur before the case is found for treatment or when treatment is interrupted; the patient under treatment contributes little to the spread of infection.

Remarkably little is understood about the circumstances which favor infection. To illustrate the range of uncertainty, experience on a tuberculosis ward may be compared with the incident of a Christmas party. It is not unusual for a nurse to serve many months on an active tuberculosis ward without becoming positive to the tuberculin test. But an entire roomful of guests at a Christmas party once was found to have been infected in a single evening by one visiting seaman, the only active case in the lot. Research is needed in human factors of susceptibility to infection and in social factors in management of tuberculosis.

Fresh infections can be found and treated promptly with less trouble and expense if re-

search succeeds in developing an inexpensive, simple, and reliable tuberculin test, more satisfactory than those available today.

With present methods of testing and screening, casefinding is likely to be most effective if it is directed to selected populations in terms of the degree of their risk, such as: contacts of active or formerly active patients, adults over 45, especially males, and certain categories known to be vulnerable, especially children under 4, children entering puberty, or persons suffering from malnutrition, or living under congested conditions.

Casefinding as well as treatment and public health supervision of cases may be improved if the medical profession looks into the circumstances of patients whose tuberculosis is first reported on the death certificate. Of all known cases of tuberculosis in the United States, about 1 in 20 is first reported at death. Of all tuberculosis deaths, one in four is first reported as a tuberculosis case at death. About three-fourths of the cases reported are in a moderately advanced or far advanced stage.

### *Vaccination*

Use of BCG, the only available vaccine, as indicated by recommendations of an advisory committee to the Public Health Service in 1957 and the American Trudeau Society in 1958, should be limited in the United States to certain highly exposed populations. Standards are needed for evaluating the activity of vaccines.

### *Strategy*

Effective treatment of patients with infectious tuberculosis is the basis of plans to prevent new infections. Programs may proceed in several phases simultaneously, according to the prevalence of infection in defined neighborhoods or sections. Attention to the geographic strongholds of tuberculosis needs to have priority over campaigns of mass screening where incidence is relatively low. After the incidence of the disease is generally reduced, and if results of studies now in progress so indicate, attention may shift from therapy of diseased patients and investigation of suspect populations to the process of screening for positive reactors to be treated.

Ultimately, a single control officer may suffice for management of tuberculosis in large regions where infections are derived only from exotic sources.

Meanwhile, special funds should be allocated from central sources to concentrate the attack where infections are most common. Resources of personnel and facilities also should be subject to more central control.

### *The Personnel*

The main burden of adequate treatment seems likely to be carried increasingly by the general practitioner in private practice, with help from the public health nurse and in some instances the medical social caseworker.

Because of the effectiveness of chemotherapy, treatment of tuberculosis more and more is managed by the general practitioner. Special instruction, consultation, and assistance by public health agencies can help private physicians to provide satisfactory treatment to tuberculosis patients. Additional services will help the patients and their families obtain assistance, as required, of the full battery of public and voluntary agencies. Such a unified program of treatment and services for all tuberculosis patients will require that physicians report without exception the cases under their care.

Cooperation of patients with treatment, especially if they remain at home under supervision, depends on attention given to their basic needs: food and shelter for the family, money for drugs and other expenses related to illness, suitable employment when they are ready, and ordinary friendliness. Remarkable cooperation has been won from patients simply by a demonstration that someone cared about them and felt it was important that they went through with the program of therapy planned for them.

In some communities, well-trained medical

social workers are available to see that patients and their families receive appropriate services. In most communities, the public health nurse has to see that the patients receive all available medical and social services they need without regard for lines of jurisdiction. In this task, the nurse is most likely to succeed if a single authority is responsible for assuring the availability and adequacy of all services to tuberculous patients, or if heads of independent agencies in the community at least meet regularly to exchange information and assistance.

### *Leadership*

Criteria of performance and achievement, district by district, and State by State, and for the Nation as a whole, will expedite the victory at every stage. Public, voluntary, and professional bodies have the opportunity to establish such criteria for casefinding, diagnosis, reporting, treatment, rehabilitation, and surveillance. How much initiative will be taken in States and local communities toward setting criteria will depend to a great extent on the attitudes of the Association of State and Territorial Health Officers, the American Trudeau Society, and other professional bodies toward such local action.

It is largely their counsel which will determine whether communities will supply needed drugs and medical services, adequate diet, and homemaker services for tuberculosis patients. They can assure that adequate laboratory services will be available to all physicians.

Their leadership will determine whether political and social action will provide means for the integration of services and continuity of care for the tuberculous patient.

With effective leadership, it is possible that a program for eliminating tuberculosis as a public health problem in the United States can be brought far toward completion within the foreseeable future.

*U.S. Army scientists investigate State regulations and processes of cleaning raw feathers for use in bedding and offer a practical disinfecting procedure.*

## Disinfection of Raw Feathers for Bedding Material

MORRIS R. ROGERS, M.A., ARTHUR M. KAPLAN, Ph.D.,  
and GEORGE COHEN, B.S.

LARGE QUANTITIES of land and water-fowl feathers are used annually by the Armed Forces as filling materials in pillows and sleeping bags. Prior to use in these bedding items, the feather filling materials are simply "well cleaned, washed, and dried" according to military specifications (1-4). Although no exact procedure for cleaning, washing, and drying the feathers is outlined in these specifications, it is presumed that the feathers purchased over the past years were processed in accordance with the bedding laws of the State in which the feathers were purchased or in some instances according to the requirements set forth by the contracting officer purchasing the feathers for the Armed Forces. These procedures were apparently adequate to permit passing the feathers for cleanliness as required under these specifications. The cleanliness test consisted of determining the oxidizable matter (oxygen number) and solvent soluble matter, excluding DDT from the latter value.

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*The authors are associated with the U.S. Army Quartermaster Research and Engineering Center, Natick, Mass. Mr. Rogers is a microbiologist and Dr. Kaplan is chief, Fungicides and Germicides Branch, Chemicals and Plastics Division. Mr. Cohen is general engineer of the Textile, Clothing, and Footwear Division.*

Forty-two States and the District of Columbia have enacted bedding laws which require, in addition to the cleaning, washing, and drying procedures, that all used bedding, and in many instances new bedding materials, must undergo some process to insure inactivation of all disease-bearing spores or disease-breeding germs, and removal of all filth, vermin, and extraneous organic matter. The final product is presumably clean and sanitary, but not necessarily sterile.

Various State regulations governing the sterilization of new down and feathers require the use of either dry-heat, hot water, flowing steam, steam under pressure, or fumigation. Answers to an inquiry addressed to three large eastern States indicated that very little research has actually been done on the sterilization of feathers. Similarly, little information has been published on the commercial sterilization of bedding materials by heat (5). The time-temperature relationships for the heat sterilization of feathers, incorporated into many State bedding laws, appear to be adaptations of the procedures used to sterilize mattresses and other bedding, with lower holding times specified in certain instances. A number of workers in the field have indicated that new feathers will be sterilized by current commercial processing. Data to support this view,

however, have not been available. Consequently, there appears to be little technical basis for the sterilization requirements of many State regulations.

Three diseases, salmonellosis, psittacosis, and histoplasmosis, transmitted to man from fowl, might be spread through the agency of feathers. *Salmonella* organisms of the types associated with salmonellosis in humans have been found in duck, hen, turkey, goose, and pigeon eggs (6-13). *Histoplasma capsulatum*, the causative organism of histoplasmosis, has been found in domestic fowl, soil, sawdust, and manure (14-17). Psittacosis has been reported in parrots, parakeets, lovebirds, canaries, chickens, turkeys, and pheasants, and the psittacosis virus has been isolated in garden soil (18-20).

It is most important to note that the literature does not establish any significant epidemiological or laboratory evidence that these diseases in humans are due to either exposure to or the handling of contaminated feathers.

However, since the organisms causing salmonellosis, psittacosis, and histoplasmosis in humans might be associated with feathers, the need for requiring sterilization of feathers procured for the Armed Forces has come under investigation. Although State bedding regulations use the term "sterilization," which can be interpreted as meaning disinfection, this is misleading since most feather processors do not actually sterilize feathers. Compliance would require the destruction of every form of life, be it plant or animal, visible or invisible under the microscope, harmful, or innocuous (21).

To avoid confusion over the use of the term "sterilization" in State bedding regulations, the position has been taken here that the sterilization requirement is not intended to insure sterile feathers in the finished article of bedding material but rather to insure the destruction of pathogenic contaminants of new feathers. If the word "sterilization" were taken literally, many feather processors would have to install new or modified equipment to meet the sterilization requirements stipulated in most State bedding regulations.

In the absence of experimental data, the purpose of this study was to determine the effectiveness of the washing, souring, and heat-drying operations in freeing feathers of potentially

hazardous micro-organisms, using laboratory, pilot plant, and commercial facilities. In addition, the effectiveness of a chemical procedure for disinfecting was investigated.

## Methods

Washing and disinfecting procedures for raw feathers were tested and evaluated in the laboratory and, on a larger scale, in a pilot plant and a commercial feather processing plant.

### Laboratory Studies

A general washing procedure (22) which closely resembles the procedure used in commercial feather processing plants was first evaluated in the laboratory to determine its bactericidal and fungicidal capacity. Sterile domestic white duck feathers obtained from a commercial source and inoculated with the test organism were used in the first series of tests. The feathers were first autoclaved for 30 minutes at 18 pounds pressure and then tested for sterility by plating a sample of the feathers in nutrient agar (Difco).

*Escherichia coli*, ATCC No. 26, and *Aspergillus niger*, QMC No. 458, were employed as test organisms. *E. coli* was grown in nutrient broth (Difco) at 37° C. for 18 hours and *A. niger* was grown at 30° C. on Sabouraud dextrose agar (Difco) for 6 to 7 days.

Three hundred and sixty-three grams, wet weight, of the sterile feathers were placed aseptically in a laboratory tumble jar and tumbled at 27 revolutions per minute with 1 gallon of water heated to 85° F. The sterile feathers were inoculated with 150 ml. of the broth culture of *E. coli* or 100 ml. of the pooled washings of two agar slants of *A. niger*. The jar was tumbled for 1 minute to permit thorough distribution of the tracer organism throughout the feathers. A 1-ml. aliquot of the inoculated feathers was removed aseptically from the tumble jar with sterile tweezers. The sample of feathers was allowed to drain free of excess water after expelling as much of the water as possible with tweezers. The 1 gram of inoculated feathers was transferred to a Waring Blendor and blended with 99 ml. of sterile water for 1 minute. A 1-ml. aliquot of the inoculated feathers suspension was then re-

moved and plated in nutrient agar or Sabouraud dextrose agar to obtain an organism count. Triplicate samples were tested which represented the controls used in these studies.

Fourteen grams of a trisodium phosphate blood solubilizer compound were added to the tumble jar and tumbled for 15 minutes. This was the end of the first wash cycle. One gram of the washed feathers was transferred aseptically to a Waring Blendor, macerated with 99 ml. of sterile water for 1 minute and plated in the applicable agar.

In the second washing cycle, the drained feathers were washed in 1 gallon of water at 85° F. containing 0.5 ounce of liquid nonionic detergent. The feathers were tumbled for 2 minutes, allowed to soak for 13 minutes with no tumbling, and drained. Bacterial counts on the feathers were taken in the usual manner.

The third and final cycle in the washing operation consisted of adding to the tumble jar 1 gallon of water at approximately 60° F., 22.4 grams of sodium silico fluoride, and 1,865 ppm of a general purpose disinfectant (23,24) having the following composition: 20 percent sodium-o-phenylphenolate, 40 percent sodium 4-chloro-2-phenylphenolate, 13 percent sodium 6-chloro-2-phenylphenolate, 14-18 percent moisture, with the remainder consisting of other isomeric phenolic compounds. The final pH was between 4 and 5, and water hardness ranged between 68 and 85 ppm as calcium carbonate. The feathers were tumbled for 15 minutes and soaked for 30 minutes in this solution. One gram of feathers was transferred to a Waring Blendor with 99 ml. of water and bacterial counts determined as previously described.

It was found in this and other unpublished studies that the need for incorporating a sorbitan monoöleate-lecithin in the agar was not required because of the small carryover of disinfectant in the dilutions used, coupled with the inactivating capacity of the peptone in the nutrient agar.

Tests were also made to determine the ability of the normal washing procedure combined with the use of the general purpose disinfectant, as previously described, to reduce or destroy the natural flora found on raw feathers.

The feathers used had not been autoclaved or inoculated with any organism prior to washing. Smears were made from representative survivor colonies which appeared on the agar plates using a simple alcoholic methylene blue stain.

### *Pilot Plant Studies*

The washing and disinfecting procedure for feathers described in the laboratory studies was repeated on a larger scale in a pilot plant located in the U.S. Army Textile, Clothing, and Footwear Division at the Quartermaster Research and Engineering Command (22).

The procedure and water sources were essentially the same as in the laboratory runs except for the amounts of materials used in the tests. Six pounds of feathers from the same lot were placed in a washer which contained 35 gallons of water at 85° F. and 3.5 ounces of a trisodium phosphate blood solubilizer compound. The feathers were agitated for 15 minutes and then drained completely. The cycle was repeated using 35 gallons of water at 85° F. and 3.5 ounces of liquid nonionic detergent.

In a third cycle, the washer was refilled with 35 gallons of tapwater at approximately 60° F. to which 3.5 ounces of sodium silico fluoride sour and 9 ounces of general purpose disinfectant (1,865 ppm) were added with a final pH reaching about 5. The feathers were held in this solution for 45 minutes, rinsed twice with warm water at 85° F., and drained. Bacteria counts were made on the feathers after each washing cycle. The results are reported in the table.

### *Commercial Studies*

The washing and disinfecting process was also evaluated on a large scale using the equipment in a commercial feather processing plant. The washer, similar to the pilot plant washer (22), except for capacity and materials of construction, was made of cast iron and consisted of a large drum 8 feet long and 4½ feet in diameter with rotating paddles mounted on a central shaft. It had a capacity of 125 pounds of dry feathers.

In the plant procedure, 125 pounds of raw white Long Island duckling feathers were dumped into a large washer containing approximately 500 gallons of water warmed to approximately 100° F. Sufficient liquid nonionic

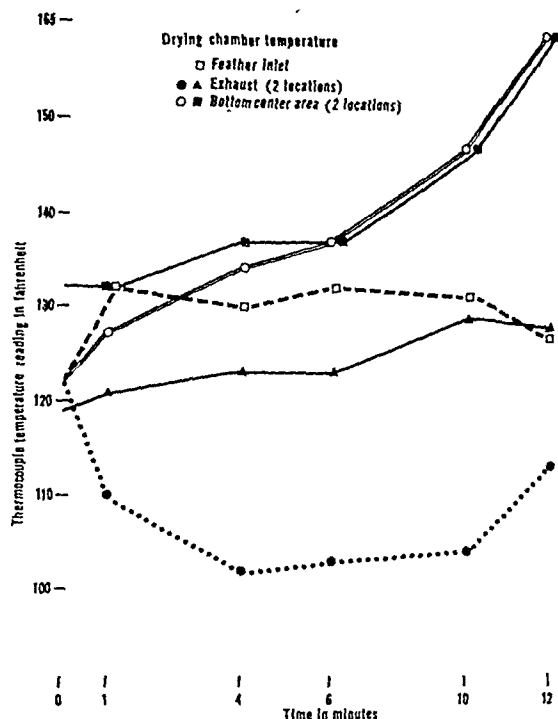


detergent, or  $\frac{1}{2}$  bucket, about 3 pounds, plus a scoop, or about 3 pounds, of alkali, and 1 cup, or about 1 pound, of sour, were put into the washer. No attempt was made to use exact amounts of alkali, detergent, or sour, since we desired to have the feathers washed with the normal variations expected under commercial processing conditions. The feathers were washed for 10 minutes and the washer drained. The feathers were then rinsed twice with water at approximately 93° F. for 20 minutes, fed into a centrifugal extractor to remove most of the water, and placed in a steam-jacketed dryer for 10 to 15 minutes.

The dryer is essentially a steam-jacketed cylinder with a series of rotating arms mounted on a shaft running along the axis of the cylinder. As the feathers begin to dry, they become airborne due to the action of the rotating paddles. The feathers are fed into the dryer cylinder through a sliding door at one end and removed by suction through a duct at the other end. During the drying operation, air is continuously removed through an exhaust duct at the top of the dryer. It usually takes about 15 minutes to dry a 50- to 60-pound lot of feathers.

Samples were taken at the feather inlet during the drying cycle. Information on the air-flow in cubic feet per minute through the dryer was not available. Temperatures were determined in the dryer by means of thermocouples placed at the feather inlet and outlet, the air exhaust, and near the bottom center of the dryer. Readings were taken at the beginning and at 1- to 4-minute intervals throughout the drying cycle. Representative temperature data are plotted on the chart. No temperature data is available from the thermocouple placed at the feather outlet since it was accidentally broken during the drying cycle. The bacteria and fungus counts on the raw feathers were also obtained before processing.

The procedure and conditions using the general purpose disinfectant were the same as previously described except that 8 pounds of the disinfectant, equal to 1,902 ppm in solution, were added to the feathers after the second rinse cycle and the feathers left in this solution for 45 minutes. Plate counts of organisms were obtained after 20- and 45-minute exposures to the disinfectant (see table).



Temperature variations in drying chamber at a commercial plant

All tests were performed within the plant where the air was dusty and filled with floating feather down. It was very difficult to prevent contamination under such conditions, especially during the sampling and plating procedures. These conditions could well account for the higher total bacteria and coliform counts obtained under commercial conditions in comparison to the laboratory tests.

## Results

Results of the washing and disinfecting processes of feathers after each treatment cycle in the laboratory are reported in the table. The natural bacteria found on the feathers appear to be readily removed or destroyed by the three washing cycles, with the exception of the spore-forming bacilli. This is further substantiated by the nearly 100 percent kill obtained when sterile feathers were inoculated with *E. coli* and *A. niger*, used as tracer organisms. The nonpathogenic spore-forming surviving organism was identified as *Bacillus subtilis* by Dr. Ruth E. Gordon, Rutgers University, New Brunswick, N.J.

Four tests were conducted in the pilot plant. Organism counts were obtained only after the feathers had been washed and immersed for 45 minutes in a solution containing 1,865 ppm of the general purpose disinfectant. Although the percent kill (see table) in these tests was not as high as that obtained in the laboratory tests, all the nonsporulating organisms present on the feathers were completely killed.

A direct comparison cannot be made between the laboratory tests, and pilot plant and commercial runs, since the larger scale tests combined essentially three different wash cycles into one operation. Also, specialized media were used in an attempt to give a clearer picture of the types and numbers of organisms that survived during the washing, disinfecting, and drying procedures.

**Percent kill of natural flora and inoculated organisms on feathers after washing and after disinfection with general purpose disinfectant under laboratory, pilot plant, and commercial conditions**

Test runs <sup>1</sup>	Natural flora		<i>Escherichia coli</i> added		<i>Aspergillus niger</i> added	
	Percent kill	Counts per gram of feathers	Percent kill	Counts per gram of feathers	Percent kill	Counts per gram of feathers
<i>Laboratory</i>						
Control.....		$5.0 \times 10^4$		$3.49 \times 10^5$		$9.0 \times 10^6$
After first washing cycle.....	86.0	$7.0 \times 10^3$	99.14	$2.98 \times 10^3$	99.92	$7.0 \times 10^3$
After second washing cycle.....	94.0	$3.0 \times 10^3$	99.85	$5.2 \times 10^2$	99.94	$5.0 \times 10^3$
After third washing cycle and soaking in 1,865 ppm disinfectant for 45 minutes.....	98.8	$6.0 \times 10^2$	99.99	$1.0 \times 10^1$	100.0	0
<i>Pilot plant</i>						
Control.....		$6.4 \times 10^4$				
After third washing cycle and soaking in 1,865 ppm disinfectant for 45 minutes.....	82.81- 92.19	$11.0 \times 10^3$ — $5.0 \times 10^3$				
	Total flora <sup>2</sup>		Coliforms <sup>3</sup>		Molds <sup>4</sup>	
	Percent kill	Counts per gram of feathers	Percent kill	Counts per gram of feathers	Percent kill	Counts per gram of feathers
<i>Commercial plant</i>						
No disinfectant added:						
Control.....		$3.0 \times 10^5$		$4.0 \times 10^5$		$26.0 \times 10^4$
After washing, rinsing, and extracting.....	33.3	$2.0 \times 10^5$	80.0	$8.0 \times 10^3$	72.0	$72.8 \times 10^3$
After drying.....	64.0	$10.8 \times 10^4$	99.4	$2.4 \times 10^3$	100.0	0
1,002 ppm disinfectant added:						
Control.....		$4 \times 10^5$		$5 \times 10^5$		$26.0 \times 10^4$
After washing, rinsing, and soaking for 20 minutes.....	99.16	$3.36 \times 10^3$	99.2	$4.0 \times 10^3$	100.0	0
After washing, rinsing, and soaking for 45 minutes.....	99.67	$1.32 \times 10^2$	98.4	$8.0 \times 10^3$	100.0	0
After drying.....	( <sup>5</sup> )	( <sup>5</sup> )	99.4	$3.0 \times 10^3$	100.0	0

<sup>1</sup> Laboratory and pilot plant tests made with domestic white duck feathers; commercial plant run used Long Island duckling feathers. Surviving organisms after laboratory and pilot plant runs were spore-forming bacilli.

<sup>2</sup> Tryptone glucose extract agar.

<sup>3</sup> Eosin methylene blue agar.

<sup>4</sup> Cooke's rose bengal agar.

<sup>5</sup> Spreader on plates made it impossible to count.

Normal commercial washing and drying procedures reduced the total count of organisms by 64 percent, coliforms by 99.4 percent, and molds, 100 percent. The addition of 1,902 ppm of the general purpose disinfectant destroyed more than 99 percent of the nonsporulating bacteria and molds, with the exception of the 98.40 percent kill of coliforms after the 45-minute soaking. We believe this reduction in percent kill resulted from contamination of the plates by polluted air. As previously stated, the air was very dusty, making it difficult to maintain aseptic techniques.

Counts were not obtained of the total number of organisms after drying due to the presence of spreaders on the agar plates. Coliform and mold counts, however, were possible since the selective media used inhibited spreaders.

Data illustrated on the chart show considerable temperature variation within the chamber where the washed and disinfected feathers were dried. It should be mentioned that feathers are not static during the drying operation and that the temperature varied within the chamber between 113° F. and 165° F. at the end of the drying cycle. This means the feathers were going through a continuous heating and cooling cycle as they moved about in the dryer.

No obvious effects were found in the feathers after immersion in the general purpose disinfectant for 45 minutes and then drying. This was confirmed by the results of filling capacity and oxygen number determinations.

## Discussion

The necessity for destroying the disease-producing organisms that might be found on feathers, such as *Salmonella*, *Histoplasma capsulatum*, and the psittacosis virus, can be considered a desirable public health requirement even though feathers have not been established as vectors of disease to the best of our knowledge. However, to require the destruction of nondisease producing organisms on raw feathers or to enforce sterilization prior to their use in bedding materials would appear to be costly, wasteful, and an exorbitant demand upon the commercial feather processors. Instead of enforcing sterilization, it would be much more realistic to require a pasteurization or disinfection

procedure which would kill all the pathogens.

Other workers (7,25) have shown that *Salmonella* is readily destroyed at 132° F. for 20 minutes and *H. capsulatum* at 131° F. for 15 minutes. Although no data are available on heat destruction of the psittacosis virus, other pathogenic viruses are inactivated at relatively low temperatures. For example, St. Louis and Japanese B-type encephalitis viruses are inactivated at 133° F. in 30 minutes, and the Russian Far East encephalitis virus is inactivated at 140° F. in 10 minutes. Types A and B influenza virus are killed by heat at 132° F. in 20 to 30 minutes. The variola or smallpox and yellow fever viruses are inactivated in 10 minutes by moist heat above 140° F. (25).

From the results of this study and the information available in the literature on the effect of heat on the destruction of the pathogenic organisms suspected to be associated with feathers, a specification requiring the three-cycle washing described in the laboratory test procedure followed by exposure of the feathers to 160° F. heat for 5 minutes, should adequately safeguard the public from a possible health hazard from feathers used in bedding materials.

An alternative disinfecting procedure to the heat treatment process is to immerse the feathers in a disinfecting bath solution such as the general purpose disinfectant. Previous studies sponsored by the Quartermaster Corps (23, 24) indicated that the general purpose disinfectant has a phenol coefficient of 71, which means that it is 71 times more effective in killing *Salmonella typhosa* than a 5 percent phenol solution. It is known (25) that 5 percent phenol will destroy *S. typhosa* in 5 minutes. The ability of the general purpose disinfectant to destroy this organism is therefore apparent. No data on the ability of the general purpose disinfectant to destroy *H. capsulatum* and the psittacosis virus is currently available. Stedman and associates (26) evaluated a mixture of 4-chloro-2-phenylphenolate, 6-chloro-2-phenylphenolate, and anhydrous potassium castor soap against *Trichophyton interdigitale* on inanimate surfaces and found a 99.0 percent reduction of the organism in 10 minutes. The mixture of 4-chloro-2-phenylphenolate and 6-chloro-2-phenylphenol-

ate has a reported phenol coefficient of 97 and further substantiates the fungicidal capacity of the general purpose disinfectant since it contains more than 50 percent of the sodium salts of these isomers. We have shown that a 100 percent reduction of mold spores has been obtained after 20 minutes soaking in the general purpose disinfectant.

It would appear, therefore, that the general purpose disinfectant has a powerful fungicidal capacity as well as germicidal efficiency. The only published virucidal data available on the action of phenolic disinfectants similar in composition to the general purpose disinfectant is a report on the virus of Newcastle disease, avian pneumoencephalitis (27). This report showed that sodium-o-phenylphenolate with a phenol coefficient of 8, at 1.0 percent concentration, destroyed the virus in 5 minutes. Since the general purpose disinfectant has a phenol coefficient of 71, it is a more potent fungicide and virucide than sodium-o-phenylphenolate but a weaker fungicide and virucide than the mixture of 4-chloro-2-phenylphenolate and 6-chloro-2-phenylphenolate. However, soaking the feathers in 2,000 ppm of the general purpose disinfectant solution for 20 minutes should allow adequate time to reduce the pathogenic organisms to a safe level. This conclusion is based on the assumption that the fungus and virus susceptibility to the disinfectant does not vary greatly from species to species within each classification.

### Summary

A study of regulations in 42 States and the District of Columbia governing the sterilization of feathers revealed great variety. Little or no technical data are available to substantiate some of the sterilization requirements, especially those pertaining to the sterilization of feathers by heat. Some requirements had little or no public health significance, others contained impractical or unnecessary provisions and still others differed markedly with respect to the same item of sanitation. The present investigation was undertaken to elucidate some of the problems confronting the U.S. Army in preparing specifications to assure that feathers purchased for use in bedding materials would

be acceptable by sanitation standards. A practical washing, heat-treating, and chemical disinfecting procedure for processing new feathers is described.

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## Training in Epidemiology

A course in applied epidemiology will be offered at the Communicable Disease Center, Public Health Service, Atlanta, Ga., May 9-13, 1960.

Designed primarily for physicians who serve as investigators of disease outbreaks or have administrative responsibility for such investigations, the course serves both as a refresher course for the experienced health administrators and as an introductory course for physicians new to public health. Emphasis is on developing an understanding of how epidemiological techniques can be used in the approach to the solutions of problems in the preventable disease field. Lecture-discussion sessions and audiovisual aids are used in the presentations, and there is much group participation which is obtained through the utilization of the group solution of epidemiological problems, seminar-type presentations, and panel discussions. Registrants will be expected to attend all sessions of the course.

Further information and application forms may be obtained from the Chief, Communicable Disease Center, Public Health Service, 50 Seventh Street NE., Atlanta 23, Ga., Attention: Chief, Training Branch.

# Blood Sugar and Syphilis Serology Using a Single Specimen

JACK J. JOLLY, B.S., WILLIAM V. WHITE, B.A., JOSEPH PORTNOY, Ph.D.,  
and JOSEPHINE W. GUTRIDGE, R.N.

**SCREENING TESTS** for diabetes and syphilis may be performed on a single blood specimen collected in a tube containing sodium fluoride, according to results obtained in recent studies.

Since the development of the Wilkerson-Heftmann method (1) using the Hewson Clinitron for the rapid examination of blood specimens for determination of sugar content, many health departments have used this testing method in mass diabetes screening programs. A number of health departments have combined diabetes screening with mass syphilis screening programs. The development of techniques for obtaining specimens for both diabetes and syphilis tests from a single venipuncture made the combination of the two screening programs economical and acceptable.

The most commonly used technique was reported by the District of Columbia Department of Public Health, and has been called the "piggyback" method (2). In this technique, a plain Sheppard tube is used to collect the specimen for serology; the needle of a second Sheppard tube containing sodium fluoride is then inserted into the rubber sleeve of the first tube to collect the specimen for sugar determination.

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The sodium fluoride prevents coagulation and preserves the glucose level for approximately 72 hours without refrigeration (3).

The Venereal Disease Research Laboratory (VDRL) slide test (4) was generally preferred for the serologic examination, and the Wilkerson-Heftmann method was used for sugar determination.

While the "piggyback" method was acknowledged to be more economical than previously used techniques, involving two venipunctures or drawing blood into a syringe and inserting the prescribed amounts into two test tubes, it still slowed up the collection of specimens for serologic screening and added to the cost of the screening program in personnel time and equipment. In addition, there was the traumatic effect on the screened of seeing the second specimen drawn.

In early 1957, the rapid plasma reagin (RPR) test for syphilis was developed by Portnoy, Garson, and Smith (5). During the same year, its acceptability for use as a rapid, practical, and economical screening test for syphilis was demonstrated by the Venereal Disease Branch, Communicable Disease Center, Public Health Service (6). More than 47,000 Mexican farmworkers, entering the United States through the border reception center, El Centro, Calif., were tested with the RPR test.

In the RPR test, the authors (5) utilized potassium oxalate, heparin, or potassium sequestrene as an anticoagulant. In diabetes screening programs, sodium fluoride in the approximate ratio of 10 mg. per cubic centimeter of blood has been a satisfactory anticoagulant and

Table 1. Comparative results of the RPR, VDRL, and TPCF tests, Chapel Hill data

Test	Number specimens	Reactive	Non-reactive	Diagnosed cases of syphilis			Sensitivity	Specificity
				Reactive	Non-reactive	Total		
RPR <sup>1</sup>	97	48	49	47	2	49	96	98
VDRL <sup>2</sup>	97	42	55	41	8	49	84	98
TPCF <sup>2</sup>	97	45	52	45	4	49	92	100

<sup>1</sup> On sodium fluoride specimen. <sup>2</sup> On conventional blood specimen.

Note: Sensitivity =  $\frac{\text{Reactors to test, confirmed as syphilitic} \times 100}{\text{Total diagnosed as syphilitic}}$

Specificity =  $\frac{\text{Nonreactors to test, confirmed as nonsyphilitic} \times 100}{\text{Total diagnosed as nonsyphilitic}}$

glucose preservative when testing is not done immediately after collecting the specimens.

In studying the need for developing practical, economical, and rapid screening programs, it became apparent that the use of a single anticoagulant and preservative for both tests would simplify the collection of specimens and minimize the cost of conducting two screening programs.

### Study 1

The Venereal Disease Experimental Laboratory, Chapel Hill, N.C., cooperated in a small pilot study to determine the feasibility of using sodium fluoride as an anticoagulant for the RPR test.

Ninety-seven sets of blood specimens were collected in a venereal disease prevention and control center, approximately half from diagnosed syphilitic patients, and half from undiagnosed screenees. The "piggyback" method was used, one Sheppard tube containing sodium fluoride, and the other containing no preservative. The following day in the experimental

laboratory, the RPR test was performed on the specimens containing sodium fluoride, and the VDRL slide test and the *Treponema pallidum* complement fixation (TPCF) test (7) were performed on the conventional blood specimens. The results of the study are shown in table 1. The diagnosis of syphilis was established or ruled out for every patient by means of a clinical diagnostic workup.

The results of study 1 indicated that the sodium fluoride tube yielded an acceptable specimen for the RPR test, making it possible to do combined syphilis and diabetes testing on a single specimen. In order to confirm the findings of this small study, results of the RPR and VDRL tests were compared on a larger volume of specimens under more typical field conditions.

### Study 2

The Virginia Department of Health and the Richmond City Health Department participated in a study using specimens of blood obtained from the city jail population during April, May, and June 1958.

Table 2. Comparative results of RPR and VDRL tests, Richmond data

Test	Number specimens	Reactive	Number reactors diagnosed as syphilitic	Relative sensitivity	Relative specificity
RPR <sup>1</sup>	1,317	156	140	98	99
VDRL <sup>2</sup>	1,317	107	100	70	99

<sup>1</sup> On sodium fluoride specimen. <sup>2</sup> On conventional blood specimen.

Using the "piggyback" method, specimens were drawn into two Sheppard tubes, one of which had been prepacked with approximately 30 mg. of sodium fluoride. The conventional specimen was drawn into the plain tube, after which approximately 3 cc. of blood were drawn into the sodium fluoride tube. Specimens were examined in the laboratory of the Virginia Department of Health. The VDRL slide test was performed on the clotted specimens, and both RPR and sugar determination tests were performed on the sodium fluoride specimens.

Specimens from a total of 1,334 persons were tested by the VDRL and RPR methods. Of these, 1,157 were nonreactive to both tests and 177 were reactive to one or both tests.

Of the 177 persons with reactive test results, 143 were confirmed as having syphilis by a clinical diagnostic workup, and 17 were diagnosed as nonsyphilitic. The remaining reactors were lost to followup and therefore no definitive diagnoses are available for these individuals (11 were reactive to both tests and 6 were reactive to the RPR test only). These persons are excluded from the final computations. Comparative results on the remaining 1,317 specimens are presented in table 2. Diagnostic workups were not done on the non-reactors and since definitive diagnoses are unavailable for this group, the terms "relative" sensitivity and "relative" specificity are used.

The results of the Richmond trial tended to confirm the findings of study 1. The results indicated that the RPR test on sodium fluoride blood specimens was a more sensitive screening technique than the VDRL slide test on blood specimens collected in the usual manner.

#### Field Trial

Following the satisfactory results of the two controlled studies, the new method of collecting blood in the District of Columbia's diabetes and syphilis screening programs was used to replace the "piggyback" technique.

During June, July, August, and the early part of September 1958, 22,965 blood specimens were drawn, using the single prepacked sodium fluoride Sheppard tube. Specimens were tested in the District of Columbia Health Department laboratory for sugar content and serologic reac-

tion. The use of this technique proved highly successful.

It has been estimated that the reduction in the number of Sheppard tubes used and the saving of clerical and technicians' time amounted to a financial saving of at least \$7,092.65 for the collecting, processing, and reporting of the 22,965 specimens.

	<i>Savings</i>
Tubes -----	\$2,066.85
2 (GS-2) clerks-----	2,170.00
Technicians' time-----	2,755.80
Miscellaneous -----	100.00
<b>Total-----</b>	<b>\$7,092.65</b>

The D.C. Health Department laboratory reported the frequent occurrence of hemolysis. Apparently, however, this has not affected the accuracy of the results of the RPR test. Hemolysis can be reduced by gentle agitation of the tubes, and by running the RPR test as soon as possible after collecting the specimen. Extremes in temperature should be avoided and refrigeration should not be used unless specimens are to be kept more than 48 hours before testing.

#### Summary

Two studies were made to determine the feasibility of using sodium fluoride as an anti-coagulant in blood specimens collected for the rapid plasma reagin screening test for syphilis.

Study 1 consisted of testing two specimens each for 97 individuals. One specimen, without preservative, received the VDRL and TPCF tests; the second specimen, containing sodium fluoride, received the RPR test. The sensitivity rates for the three tests were: RPR, 96 percent; VDRL, 84 percent; and TPCF, 92 percent. The RPR and VDRL tests showed a specificity of 98 percent, and TPCF tests showed a specificity of 100 percent.

Study 2 compared results of VDRL and RPR tests on 1,317 sets of specimens (VDRL, conventional specimen; RPR, sodium fluoride specimen). The relative sensitivity of the RPR test was 98 percent, the VDRL, 70 percent. The relative specificity of the RPR test was 99 percent, the VDRL, 99 percent.

In the field trial, the District of Columbia



Table 1. Comparative results of the RPR, VDRL, and TPCF tests, Chapel Hill data

Test	Number specimens	Reactive	Non-reactive	Diagnosed cases of syphilis			Sensitivity	Specificity
				Reactive	Non-reactive	Total		
RPR <sup>1</sup> -----	97	48	49	47	2	49	96	98
VDRL <sup>2</sup> -----	97	42	55	41	8	49	84	98
TPCF <sup>2</sup> -----	97	45	52	45	4	49	92	100

<sup>1</sup> On sodium fluoride specimen.      <sup>2</sup> On conventional blood specimen.

NOTE: Sensitivity =  $\frac{\text{Reactors to test, confirmed as syphilitic} \times 100}{\text{Total diagnosed as syphilitic}}$

Specificity =  $\frac{\text{Nonreactors to test, confirmed as nonsyphilitic} \times 100}{\text{Total diagnosed as nonsyphilitic}}$

glucose preservative when testing is not done immediately after collecting the specimens.

In studying the need for developing practical, economical, and rapid screening programs, it became apparent that the use of a single anti-coagulant and preservative for both tests would simplify the collection of specimens and minimize the cost of conducting two screening programs.

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# Problems in the Diagnosis and Treatment of Gonorrhea

WARFIELD GARSON, M.D., M.P.H., and GERALD D. BARTON, M.D., M.P.H.

THE LIMITATIONS and special usefulness of clinical and laboratory techniques in the diagnosis of gonorrhea are not well understood by the average practitioner today. Many physicians and clinics, because of complacency or lack of ancillary aid in diagnosis, employ measures for the treatment, management, and control of this disease which appear poorly justified in the light of newer research findings.

Diagnosis in the female is a major factor in both the clinical and control aspects of gonorrhea. It is generally assumed that the best procedures for the diagnosis in women is by smears and cultures taken from appropriate sites and correlated with clinical data. Studies by the Public Health Service utilizing the very best clinical and laboratory groups indicate, however, that clinical information plus smears and cultures result at best in the diagnosis of only 50 to 75 percent of those females having gonorrhea (1, 2).

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*Dr. Garson is director of the Venereal Disease Experimental Laboratory, Communicable Disease Center, Public Health Service, and research professor and head of the department of experimental medicine of the School of Public Health, University of North Carolina, in Chapel Hill. Dr. Barton is chief, Communicable Disease Center Services, Public Health Service, Region VII, Dallas, Tex. The paper was delivered at the 17th annual meeting of the United States-Mexico Border Public Health Association in Brownsville, Tex., April 1, 1959, and will appear this month in Spanish in the Bulletin of the Pan American Sanitary Bureau (World Health Organization Regional Office for the Americas).*

This indicates that the most sensitive, practical indicator of gonorrhea in the female is the anterior urethra of a susceptible male. Such information should clearly point out the limitations in current techniques for diagnosis and place in proper perspective the importance of the epidemiological diagnosis of this disease. Certainly our control efforts cannot succeed if one out of every two to four women who have gonorrhea cannot be detected by current laboratory procedures and are available in the community as a focus for continued transmission of the disease.

## Penicillin Susceptibility

There is a rather commonly held concept that the organisms causing gonorrhea and syphilis are similarly highly susceptible to the action of penicillin. While this is true concerning *Treponema pallidum*, it is not, and never has been, true for *Neisseria gonorrhoeae*. It has always taken more penicillin per organism to achieve a minimal inhibitory concentration (MIC) for the gonococcus than for the treponeme. Furthermore, the gonococcus has been observed to have a wide range of susceptibility to the action of penicillin, depending upon the strain of the organism tested.

During the period 1945-47 several investigators tested more than 200 strains of *N. gonorrhoeae* and found that all were inhibited by 0.05 unit or less of penicillin per milliliter. In 1955, however, Thayer and associates of the Public Health Service Venereal Disease Experimental Laboratory found that of 31 strains tested, only 78 percent were inhibited in this

Health Department initiated the use of the study technique (June 1958) and reported a financial saving of at least \$7,092.65 on the collecting, processing, and reporting of the first 22,965 specimens.

The use of this technique not only simplified the collecting and handling of specimens, but it also eliminated approximately half of the clerical work; and because of the speed and ease with which the specimen was collected, minimized the traumatic effect on the screenee.

The results of these studies indicate that the sodium fluoride tube yields an acceptable specimen for the RPR test, thereby making it possible to combine syphilis and diabetes screening programs using a single blood specimen for both tests.

The method is recommended as acceptable, practical, and economical for use wherever it is desirable to do syphilis and diabetes screening on the same population group.

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## Milwaukee's Fluoridation Reduces Caries

A dental examination of 4,660 school children conducted by the Milwaukee Health Department following 6 years of fluoridation of Milwaukee's water supply revealed a significant reduction in the incidence of dental decay in all age groups, 5 through 13 years. Fluoridation levels were 0.9 parts per million in the winter and 0.7 parts per million in the summer.

The DMF index for a 7-year-old child was 1.29 prior to fluoridation and only 0.53 after 6 years of fluoridation, a reduction of some 59 percent in the amount of dental decay.

After fluoridation 8-year-old children showed decay in 46.9 percent of their 6-year molars; prior to fluoridation the comparable figure was 81.1 percent. Of the 6-year-old children entering the first grade this year, 31.0 percent were free from caries in their deciduous teeth; before fluoridation the percentage was 20.8.

During the 6-year period, the total cost of fluoridation was \$240,468. The total saving in dental care necessary for permanent teeth was approximately \$718,164. The annual per capita cost of fluoridation was estimated at 5½ cents.

A second study is projected 6 years from now after 12 years of fluoridation of Milwaukee's water supply.

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During the period 1945-47 several investigators tested more than 200 strains of *N. gonorrhoeae* and found that all were inhibited by 0.05 unit or less of penicillin per milliliter. In 1955, however, Thayer and associates of the Public Health Service Venereal Disease Experimental Laboratory found that of 31 strains tested, only 78 percent were inhibited in this

lower range, while 22 percent required 0.1 unit or more per milliliter. Subsequent studies by Thayer and associates (1957), Curtis and Wilkinson (1957), and others have shown that from 20-30 percent of the more than 500 strains tested were inhibited only by the higher levels of penicillin (see table). Thus, over the past decade natural isolates of the gonococcus have indicated a definite and continuing proportional decrease in sensitivity to penicillin (3). In the United States, strains of the gonococcus inhibited by a minimal concentration of penicillin as high as 0.333 unit per milliliter have been observed; and, in the past few years particularly, more and more natural strains inhibited by minimal concentrations above 0.1 and 0.2 unit per milliliter. These higher MIC's exceed levels obtainable by usual doses of the type of penicillin given in the recent past in clinics throughout this country (4). Under these circumstances we would, of course, expect to see treatment failures on the basis of dose of drug alone, and, indeed, this is exactly what has been observed in a number of clinics where studies have been carried out to determine this and other factors in the treatment of gonorrhea (5-9). While the time-dose relationship is not so apparent in gonorrhea as it is in syphilis for successful treatment, it is an important factor in approaching the logical and effective use of penicillin. Observations by Thayer and associates have shown that the bacteriocidal effect of penicillin on the usual

strain of the gonococcus is detectable between the fourth and fifth hour of contact. From a practical standpoint such killing is usually complete by the 12th hour. Although a few strains tested on semisolid media were found to contain viable organisms through 24 hours of contact with penicillin, no strain has ever survived under these circumstances to 48 hours of exposure (10).

These investigators have also shown that cellular components can protect at least some of the gonococci from the action of penicillin. Using tissue culture techniques, it was observed that both HeLa cells and rabbit fibroblasts were capable of engulfing a certain proportion of the gonococci to which they were exposed. Further, it was demonstrated that penicillin, when applied to the medium, would kill extracellular gonococci but would not affect intracellular organisms. The presence of penicillin up to as long as 96 hours had no effect against the intracellular organisms, while at the appropriate MIC most extracellular daughter cells were killed within 5 to 12 hours. Inactivation of penicillin by penicillinase and changing either the osmotic relationships of the medium or disrupting tissue cells with engulfed organisms allowed for the recovery of the gonococci in a viable form on culture media up to as long as 240 hours thereafter. These recovered gonococci had the same MIC as the killed extracellular organisms. That the gonococcus is inevitably protected against all agents tested to

Reported studies on susceptibility of *Neisseria gonorrhoeae* to penicillin

Author	Survey dates	Number of strains	Percent inhibited by (units per milliliter)		Range
			0.06 or less	0.10 or more	
Lankford	1945	100	100	0	0.005 - 0.025
Love and Finland	1945	24	100	0	.002 - .008
Romansky and Robin	1947	53	100	0	.002 - .060
Love and Finland	1947	104	100	0	.002 - .033
Love and Finland	1949	52	96	4	.005 - .333
Marcuse and Hussels	1950-52	232	99.6	0.4	.008 - .125
Schummer and Hubbes	1951	100	98	2	.004 - .125
Love and Finland	1954	106	100	0	.002 - .033
Thayer and associates	1955-56	31	78	22	.005 - .200
Thayer and associates	1957	46	70	30	.005 - .200
Cradock-Watson	1957	200	81	19	.008 - .512
Curtis and Wilkinson	1957	302	80	20	.004 - .500
Thayer and associates	1958	40	92	8	.0025 - .120

date under these circumstances has been shown by extension of this work to include not only penicillin but also a wide variety of antibiotic and chemotherapeutic agents (11).

### Proposals

On the basis of these findings, Garson in 1956-57 proposed a working hypothesis for the treatment and management of gonorrhea which may be summarized briefly as follows (4).

- Sufficient penicillin must be given the patient so that the units per milliliter of serum will exceed the highest known MIC associated with any strain of the gonococcus in this country. Roughly, at this time, this would mean a serum level of 0.35 unit per milliliter.

- Such a level must be maintained in contact with the gonococcus for a period of at least 24 hours and preferably 48 hours. Based upon the laboratory in vitro work previously described, such time contact would allow for a complete bacteriocidal effect against any known gonococcus.

- Provisions should be made for treatment with very long-acting penicillin. This is necessary for two reasons: although 48 hours of exposure will kill all gonococci in vitro, we do not know when such exposure is liable to occur in vivo, particularly in the female. In other words, we could not treat a patient, obtain a 48-hour continuous penicillin blood level, and assume that the gonococcus in various foci in the female genitourinary tract had had an equal 48 hours of exposure. The second point is even more important. After being cured of gonorrhea, the individual may return to a milieu of venereal disease as a susceptible person and become reinfected in short order. It is possible with benzathine penicillin to obtain blood levels beyond 45 days in the human patient. While we do not know the exact minimum concentration of continuous penicillin that will protect an individual exposed to gonorrhea, it is known empirically that this system when applied does reduce the repeater load in venereal disease clinics.

This treatment is termed "antibiotic quarantine" by Dr. Ira Schamberg of the venereal disease clinics in Philadelphia, where he, as well as others, have demonstrated the effectiveness

of this approach in reducing repeaters in attendance (8, 9, 12, 13).

There is yet another factor to be considered in relation to the use of a long-acting penicillin. If it is true that, particularly in the female, certain tissue cells of the genitourinary tract are capable of taking viable gonococci within them and protecting such organisms from the effects of penicillin as has been demonstrated in tissue cultures, then with the dissolution of the host cell, viable gonococci are available for the autoinfection of the host. As such viable gonococci could be released some weeks after the initiation of therapy, it is obvious that the presence of long-acting penicillin in such a patient would be a deterrent to autoinfection. I must stress here that this is a hypothesis and has not yet been confirmed by clinical research. Nonetheless, until we know more about the disease in this regard, it behooves us to take such action as would prevent the likelihood of its occurrence.

Preston and Dunsworth in 1957 found that of 135 female patients treated with 600,000 units of penicillin aluminum monostearate (PAM), 24.4 percent yielded positive cultures 7 or 14, or both, days after treatment (7). In a second series of 65 such patients, the dosage of PAM was increased to 1.8 million units and the followup time was shortened to 3 and 7 days after treatment. In this series, only 4.6 percent yielded positive cultures. Two additional groups were tested to verify the finding that the dosage of 600,000 units of PAM was inadequate for a high percentage of cure. Of 77 women treated with 600,000 units, 16.8 percent yielded positive cultures during followup. Of 106 women treated with 1.8 million units, only 3.8 percent yielded positive cultures. If the number of probable reinfections is deducted, these authors estimate that the true failure rate with 600,000 units of PAM is 13 percent. They conclude that 1.8 million units of PAM is necessary for an acceptable rate of cure in females.

Hookings has used a treatment regimen consisting of a mixture of 600,000 units of PAM plus 1.2 million units of benzathine penicillin G. (5, 6, 13). His treatment schedule, applied in a rapid casefinding gonorrhea program, includes not only diagnosed early gonorrhea in women but also the prophylactic treatment of

all other women brought to observation; in addition, he has submitted men to this treatment schedule.

The results may be described briefly as follows: Using the attendance of diagnosed male cases as the criterion of success, the number of such cases was reduced by 18 percent at the end of 9 months and further reductions have occurred in subsequent experience. There was a decline also in the number of women who, having been named as contacts, were again named within 60 days. This decline was from 15 percent with the treatment previously employed (that is, 600,000 units PAM alone) to approximately 1.7 percent with the 1.8-million-unit dosage of mixed treatment.

In the light of today's knowledge, we must raise our sights in the treatment of gonorrhea to higher levels of penicillin extending over a much longer time period than has been used in the past (14). I believe it is obvious that the control of gonorrhea can be enhanced by the application of this knowledge in treatment. The epidemiologist can feel more secure that his patient will not be reinfected before he has the opportunity of finding source and spread cases, and he will have a longer effective period during which investigations may be conducted to bring contacts to epidemiological or specific treatment. Of greater importance, the tendency of the gonococcus to develop further resistance to penicillin can be blocked.

The problem of uncomplicated gonorrhea in the male is of course considerably less difficult in relation to diagnosis and treatment. In these days of the rediscovery of nongonococcal urethritis (NGU), it would be wise to take routinely at least smears on male patients to aid in the differentiation between gonorrhea and NGU. When occasional treatment failures of gonorrhea occur and NGU has been excluded, cultures should be obtained and the susceptibility of the gonococcus to penicillin determined to aid as a guide in therapy. It is perhaps worth while, too, to remind the epidemiologists that British, Danish, and American investigators have reported what appears to be cases of asymptomatic gonorrhea in the male (15-19).

For many years, it has been rather widely accepted that the endotoxin of *N. gonorrhoeae* responsible for the basic cellular pathology of

the disease, was a protein. Recently, however, Tauber and Garson have obtained a protein material from the gonococcus which is consistent with all past criteria referable to the endotoxin of the gonococcus (20). In an attempt to increase the toxicity and lethality of this endotoxin to animals and to purify the endotoxin for chemical characterization, they found that most of the toxicity could be related to nucleoprotein (21). By applying techniques unavailable to workers of the past, they were able to separate a previously unknown lipopolysaccharide phosphate from the protein endotoxin. The bulk of the toxicity was to be found in this phosphate rather than the nucleoprotein (22). If these new studies are confirmed, it would appear that the endotoxin of the gonococcus is not a protein, but rather a lipopolysaccharide.

This observation would be of extreme importance in relation to development of specific antigens for serologic testing for gonorrhea, as well as to the possible development of a relatively specific skin test for the disease. Further, as saccharide antigens are usually more closely related to protective immunity than are protein antigens, such studies may lead to a means of developing hyperimmunity in the host sufficient to protect against naturally acquired gonorrhea.

It appears we are once again upon the threshold of a renaissance in new knowledge about the gonococcus and gonorrhea. One of the many areas of findings being pursued is the exciting research concerning the adaptation of the fluorescent antibody techniques to the gonococcus, which could allow for the specific detection of gonococci in a stained smear within 30 minutes or the utilization of this technique for a serologic test for the disease (23). If this research is successful, it may be reflected in our clinical and public health practice in the not too distant future.

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## Quarantine Data

★ The number of people detained in ports of entry for medical observation in fiscal year 1959 increased nearly 400 percent, from 124 in fiscal year 1958 to 607 in 1959. This sharp increase was due largely to the outbreak of smallpox in Heidelberg, Germany, in December 1958.

★ The number of incoming travelers who were allowed to continue to their destinations in the United States but were required to be under medical surveillance for a time because of possible exposure to a quarantinable disease, increased more than 100 percent, from 58,083 in fiscal year 1958 to 117,310 in 1959. Most of these persons came from areas where there were occurrences of smallpox and yellow fever. In cases where the danger of exposure was serious, the Foreign Quarantine Service notified local health officials at the destination of the traveler.

★ In fiscal year 1959, 5,264,354 persons subject to quarantine inspection arrived in the United States, both aliens and returning citizens. This was an increase of more than 2 million over 1949.

★ In fiscal year 1959, there were 70,607 inspections of airplanes for quarantine or immigration-medical purposes, an increase of 50 percent over 1949. There were 33,271 inspections of ships, an increase of 37 percent over 1949.

★ The Public Health Service has increased its vigilance against yellow fever in two ways: control measures in the United States and cooperation with other countries.

To reduce the number of *Aedes aegypti*, the yellow fever mosquito, the Public Health Service has recently carried out a survey and control program at more than 100 international airports and dock

areas in the southern States, Hawaii, Puerto Rico, and the Virgin Islands, and at Mexican border crossing points. Highest "population index" was nearly 10 percent in Key West, Fla.; that is, mosquito larvae were found in 10 percent of the premises surveyed there. By an all-out campaign against the mosquito, the Key West health department reduced the index to less than 3 percent.

In Miami, the index at the international airport was 4 percent in July 1957. The Foreign Quarantine Service and the local health depart-

ment set out to reduce this index and was so successful that during a 6-month period in 1959, when the weather was most favorable to insect breeding, no yellow fever mosquitoes were found at the airport.

★ At the Mexican border, local crossings subject to quarantine inspection totaled an estimated 90,000,000; crossings from the interior of Mexico, 1,500,000; migratory labor examinations, 440,000. The staff numbered 124.

★ The 1959 Foreign Quarantine Service budget for activities at United States ports was \$3,950,869.

**Statistics of the Foreign Quarantine Service, Public Health Service, fiscal year 1958-59.**

Stations	Number of inspections		Number of inspections of passengers and crew		Number of inspection personnel <sup>1</sup>
	Vessels	Planes	Vessels	Planes	
Mobile, Ala.-----	986	1	41,182	15	6
Anchorage-----	1	830	35	34,775	(?)
San Diego-----	560	551	25,098	2,182	4
San Francisco-----	1,051	294	104,419	9,960	7
Los Angeles-----	1,974	2,364	86,956	77,254	8
Jacksonville-----	676	22	12,766	106	1
Miami-----	1,998	19,293	14,000	248,067	27
Tampa-----	1,032	859	19,458	5,437	8
Honolulu-----	360	3,346	55,917	165,030	5
Chicago-----	73	1,139	1,100	43,620	2
New Orleans-----	2,271	2,053	81,582	64,440	9
Baltimore-----	1,688	43	59,581	1,735	8
Boston-----	934	2,688	40,080	95,480	12
Detroit-----	85	432	34	17,103	1
New York City-----	5,655	18,837	901,466	874,269	80
Philadelphia-----	2,349	92	85,403	4,298	9
Fort Monroe, Va.--	1,897	4	70,165	245	9
Galveston-----	501	2	21,374	79	5
Seattle-----	524	462	58,949	11,041	5
San Juan, P.R.-----	760	4,578	50,683	85,507	6
Smaller stations-----	7,896	12,717	225,012	119,200	20
Total-----	33,271	70,607	1,955,760	1,859,843	232

<sup>1</sup> Includes medical officers, quarantine inspectors, and sanitation inspectors. Does not include part-time contract personnel.

<sup>2</sup> Coverage provided by contract personnel.

# Fluorescent Antibody Tests for Detection of the Gonococcus in Women

W. E. DEACON, WILLIAM L. PEACOCK, Jr., ELIZABETH M. FREEMAN, AD HARRIS,  
and WILLIAM L. BUNCH, Jr., M.D.

THE successful application of the fluorescent antibody (FA) method for the identification of *Neisseria gonorrhoeae* in men prompted an investigation of the use of this method for the detection of gonococcus in women. The preparation and use of fluorescein-labeled antiserums for the detection of the gonococcus in males was described in a previous publication (1).

Conventional culture procedures for *N. gonorrhoeae* identification in females, though recognized as superior to any other methods presently available, are slow, cumbersome, and costly in performance. Because of this, the culture method has been largely abandoned in many laboratories. The development of a more rapid, and a less complicated gonococcal detection method would therefore appear to have much to offer in future venereal disease programs aimed at the control of gonococcal infections.

In a recent study of gonorrhea in female contacts, Goldstein (2) found 16 percent positive by culture. Mahoney and associates (3) reported 21 percent positive in an examination of 2,429 women of the prostitute class. Stuart and Crookes (4) identified the gonococcus in 20.3 percent of 2,288 women examined at the main

venereal disease clinic of the Provincial Division of Social Hygiene, Edmonton. H. R. Morton found 47.4 percent of the female contacts in his study group to be positive (personal communication). From these and other reports (5), it may be concluded that the culture method, when performed under the most favorable circumstances, is capable of detecting the gonococcus in women in from 16 to 47.4 percent of the cases.

The aim of this study has been the development of a rapid fluorescent antibody procedure for *N. gonorrhoeae* detection, capable of obtaining equal or superior results to those reported for the culture method.

## Materials and Methods

Female subjects, constituting the study group, were named contacts of men with gonorrhea seen at the clinic of the division of venereal disease control, Fulton County Health Department, Atlanta, Ga. The usual methods were used in performing pelvic examinations, and no special or unusual techniques were employed in obtaining specimens.

### *Direct Fluorescent Antibody Method*

Specimens were obtained from three sites; the urethra, vagina, and cervix, by means of sterile, cotton-tipped applicator sticks. Slides were prepared in duplicate for smears from each site. Smears were fixed and stained for 1 hour at 37° C., and conjugates were prepared as described previously (1), except in the present study a 24-hour, heat-killed (100° C. for

*Dr. Deacon is a microbiologist, Mr. Peacock and Miss Freeman are bacteriologists, and Mr. Harris is director of the Venereal Disease Research Laboratory, Venereal Disease Branch, Communicable Disease Center, Chamblee, Ga. Dr. Bunch is venereal disease control officer, Fulton County Health Department, Atlanta, Ga.*

1 hour) *Aerobacter cloacae* culture (Jordan strain) was used for control and removal of free fluorescein. Conjugates which stained heat-killed *A. cloacae* smears were absorbed with an equal volume of saline-washed, packed cells. Absorption with an equal volume of saline-washed, dried beef bone marrow (Difco) was also used for the same purpose and with similar results. Leitz and Reichert ultraviolet light microscope assemblies were used for determining fluorescents. A desirable contrast between background and specific *N. gonorrhoeae* fluorescents was obtained by the proper selection of filters. A blue background was used to define the gonococcus in an intracellular position.

The recognition of *N. gonorrhoeae* by direct FA constituted a complete test or identification (fig. 1). Photomicrographs were recorded on Super Anscochrome daylight film using a basic exposure time of 5 minutes.

#### *Delayed Fluorescent Antibody Method*

Slants (30 mm. butt and 30 mm. slant) were prepared from Difco GC medium base plus hemoglobin and supplement B. This medium was placed in 15- by 125-mm. tubes sealed with culture tube closures B16 (7). Specimens were collected by means of sterile, cotton-tipped applicator sticks as described for the direct FA procedure. Slants were inoculated immediately after specimen collection by rotating and rubbing the swab over the surface of the medium. The stick was then broken so that the cotton swab remained in the tube, supported by the butt. After inoculation, slants were immediately placed in a candle-jar and held at room temperature until subsequent inoculations were performed from another patient, at which time the jar was again opened. After completion of specimen collections (4-6 hours), candle-jars were incubated for 16-20 hours at 35° C. Slant growth was mixed by the original swab left in the tube. This swab was also used to prepare heavy smears. These were allowed to air-dry. All delayed FA smears were fixed for 10 minutes in 3 percent formalin in phosphate buffered saline pH 7.2. This was followed by a distilled water rinse. Slides were finally blotted and allowed to air-dry. Subsequent staining with fluorescent



Figure 1. Identification of *Neisseria gonorrhoeae* in vaginal smear by the direct fluorescent antibody technique

antibody and microscope observations were the same as for direct FA. The demonstration of *N. gonorrhoeae* constituted the complete test (fig. 2).

#### *Culture Method*

The medium used for petri plates, the method of obtaining the specimen, inoculation and candle-jar procedure were as described under delayed FA. After plates were incubated for 24 hours at 35° C., they were examined for oxidase-positive colonies, and purification by replatings was instigated. CTA medium (BBL) plus 0.5 percent carbohydrate and 0.1 percent cornstarch was used for fermentation studies.

#### **Results**

Table 1 compares the direct and delayed fluorescent antibody methods with the conventional culture identification of the gonococcus. In the detection of individuals harboring *N. gonorrhoeae*, culture and the delayed FA procedures appear to be in agreement, each demonstrating 58 percent positive results. The delayed FA method, however, shows a higher degree of sensitivity in relation to total sites tested, 71 compared with 67 for the culture



Figure 2. Delayed fluorescent antibody method: Note on left heavy contamination as seen by tungsten illumination. On right-hand side is the same field under ultraviolet illumination showing well-defined gonococci.

technique. It will be noted in this regard that if culture alone had been used on cervical examinations, two individuals harboring *N. gonorrhoeae* would have gone undetected. Similar findings were also obtained in urethral examinations, 22 positives being detected by the delayed FA, and 20 by culture.

In contrast to the delayed FA technique, the direct FA procedure obtained positive results in 26 percent of all patients, or 41.4 percent of those proved by the delayed FA technique. In no case did direct FA demonstrate positive results without also obtaining similar findings by the delayed FA method. Invariably, when one or more sites (vagina, urethra, or cervix) were found positive by direct FA, two or more sites in the same individual were detected by the delayed FA method.

A further comparison of the direct and the delayed FA procedures is shown in table 2. As in the first series of patients, 58 percent of this group also demonstrated positive findings by the delayed FA method. Direct FA detected 24 percent of the individuals harboring *N. gonorrhoeae*. The delayed technique produced positive results in urethral smears in 38 percent of the patients, 44 percent positive were demonstrated from the vagina, and 46 percent from the cervix smears. If positive sites are

combined, vagina and urethra examinations account for 50 percent of the gonococcus detections, vagina and cervix for 55 percent, and a combination of all three sites for the highest result, or 58 percent.

#### Discussion

Direct FA identification of the gonococcus in females as demonstrated in this study may be accomplished in approximately 1 hour. It is obvious, however, that *N. gonorrhoeae* detection by this method is limited and dependent upon quantity of pathogens at the site at the particular time of examination. This effect is minimal when the delayed FA procedure is used. If one considers fluorescent antibody identification from the practical application standpoint, a saving of 3 to 9 days over the conventional culture procedures is effected. Other savings, of course, include the technician's time, culture media, and equipment.

One of the unexpected results was the high percentage of positive findings in vaginal examinations. Although culture findings (table 1) appear to be nearly equal to those demonstrated by the delayed FA technique, one must consider that cultures were performed under nearly ideal conditions. It should be empha-

1 hour) *Aerobacter cloacae* culture (Jordan strain) was used for control and removal of free fluorescein. Conjugates which stained heat-killed *A. cloacae* smears were absorbed with an equal volume of saline-washed, packed cells. Absorption with an equal volume of saline-washed, dried beef bone marrow (Difco) was also used for the same purpose and with similar results. Leitz and Reichert ultraviolet light microscope assemblies were used for determining fluorescents. A desirable contrast between background and specific *N. gonorrhoeae* fluorescents was obtained by the proper selection of filters. A blue background was used to define the gonococcus in an intracellular position.

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**Table 1. Comparison of culture and direct and delayed fluorescent antibody methods for identifying gonococcus, 50 female contacts**

Method	Positive vagina		Positive cervix		Positive urethra		Total sites positive		Total patients positive	
	Number	Percent	Number	Percent	Number	Percent	Number	Percent	Number	Percent
Direct FA.....	13	26	4	8	5	10	22	14.6	13	26
Delayed FA.....	24	48	25	50	22	44	71	47.3	29	58
Culture.....	24	48	23	46	20	40	67	44.6	29	58

sized, particularly in relation to vaginal examinations, that culture results were obtained only through laborious platings and multiple isolation attempts prior to fermentation studies. Vaginal examinations (presumptive and confirmation by fermentations) frequently required 10 days or more for completion. This was also true for other examination sites where heavy contamination complicated *N. gonorrhoeae* identification.

The following are offered as well-defined procedures for the rapid identification of *N. gonorrhoeae* in females by the direct and delayed FA methods.

1. The greatest yield of positive findings may be expected if specimens from the vagina, cervix, and urethra are included in the examination. The vagina and urethra, as a combination will result in satisfactory findings, and may be used where complete clinic facilities are not available, such as examination table and speculum.

2. Duplicate smears from each site should be prepared. These are used for direct FA identification. At least one slant may also be prepared from each site and examined by the delayed FA procedure.

3. Direct FA slides demonstrating positive

results constitute a complete examination. Delayed FA needs completion only if the direct procedure fails to demonstrate gonococci. If desired, delayed FA may be used to confirm direct FA findings.

4. Fixation of air-dried smears (direct or delayed) is best accomplished by 10 minutes in 3 percent formalin in phosphate buffered saline pH 7.2. This is followed by a thorough washing in distilled water, and finally blotting before application of fluorescent antibody. Positive findings from any site constitute a completed examination.

#### Summary

Fluorescent antibody methods have been developed for the rapid identification of *Neisseria gonorrhoeae* in women. A combination of the direct and delayed fluorescent antibody methods was clearly demonstrated as superior to the conventional culture method. The delayed FA method gave a slightly higher yield of positive results in less time than the conventional culture method. The delayed FA method was superior to the direct method alone. The value of vaginal examinations in addition to the customary urethral and cervical tests is indicated.

**Table 2. Comparison of the direct and delayed fluorescent antibody methods for identifying gonococcus, 100 female contacts**

Method	Positive vagina		Positive cervix		Positive urethra		Total sites positive		Total patients positive	
	Number	Percent	Number	Percent	Number	Percent	Number	Percent	Number	Percent
Direct FA.....	9	9	8	8	7	7	24	8.0	24	24
Delayed FA.....	44	44	46	46	38	38	128	42.6	58	58

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**Table 2. Comparison of the direct and delayed fluorescent antibody methods for identifying gonococcus, 100 female contacts**

Method	Positive vagina		Positive cervix		Positive urethra		Total sites positive		Total patients positive	
	Number	Percent	Number	Percent	Number	Percent	Number	Percent	Number	Percent
Direct FA.....	9	9	8	8	7	7	24	8.0	24	24
Delayed FA.....	44	44	46	46	38	38	128	42.6	58	58

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## PUBLICATION ANNOUNCEMENTS

Address inquiries to the publisher or sponsoring agency. WHO publications may be obtained from the Columbia University Press, International Documents Service, 2960 Broadway, New York 27, N.Y.

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# Evaluation of tpcf-50 Test And Other TPCF Tests For Syphilis Diagnosis

HILFRED N. BOSSAK, WILLIAM P. DUNCAN,  
AD HARRIS, AND VIRGINIA H. FALCONE

In recent years, the *Treponema pallidum* immobilization (TPI) test has become one of the most valuable laboratory aids in resolving problem cases in the diagnosis of syphilis. Because of its expense and complexity, however, its use has always been limited to a few large, central laboratories. The phenomenon of immobilization of *T. pallidum* in the presence of treponemal antibody and complement was first used in a serologic test for syphilis described by Nelson in 1949 (1). Since then, there have been continuing efforts by many workers to devise other procedures employing the *T. pallidum* as an antigen in serologic tests which might be more simply and rapidly performed, and which might serve as substitutes for the TPI test. Demonstration of an antibody in syphilitic serum which would agglutinate suspensions of killed *T. pallidum* (2), and the immune adherence phenomenon (3) resulted in the development of serologic tests (4-7) which used the whole, killed treponeme as an antigen. One of the most recent promising developments has been the application of fluorescent antibody techniques to the detection of treponemal antibodies (8).

The use of an extract of the *T. pallidum* as an antigen in a conventional complement fixation test was described by Portnoy (9) in 1955. This sodium desoxycholate extract was used in a modified one-fifth volume Kolmer test and was designated as the *Treponema pallidum* complement fixation (TPCF) test (10). The procedure (TPCF I) and an experimental

modification (TPCF II) were entered and performed by Portnoy in the Serology Evaluation and Research Assembly (SERA) Study (11). A second modification, referred to as the "tpcf-50" test, has recently been described by the same author (12), and is referred to as the preferred method, because of increased specificity and economy of time and reagents.

This report presents the comparative results obtained with the three *Treponema pallidum* complement fixation tests and the *Treponema pallidum* immobilization (TPI) test on serums from donors in selected patient categories.

## Materials and Methods

A serum bank has been established at the Venereal Disease Research Laboratory, Communicable Disease Center, Chamblee, Ga., to facilitate evaluation of new serologic tests for syphilis or modifications of published methods. This bank is composed of serums from clinically categorized donors, and includes residuals from approximately 1,200 specimens which were included in the SERA study, in addition to serums from other sources. Convenient aliquots of unheated serum from these selected donors are stored in the frozen state and are drawn from the bank as needed.

The serums are classified in the following donor categories:

### PRESUMED NONSYPHILITIC

- Apparently healthy donors presumably with no history of previous or present infection with syphilis.

### SYPHILITIC

- Donors with primary syphilis proved by darkfield examination, who had not received treatment.

- Patients having had primary syphilis proved by darkfield examination and who had adequate treatment with 2,400,000 units or more of penicillin not less than 2 nor more than 4 years prior to time blood was taken.

- Donors with secondary syphilis proved by darkfield examination, who had not been treated.

- Patients with secondary syphilis proved by darkfield examination who had adequate treatment.

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Mr. Bossak, Mr. Duncan, and Mrs. Falcone are bacteriologists with the Venereal Disease Research Laboratory of the Communicable Disease Center, Chamblee, Ga., of which Mr. Harris is director.

ment with 2,400,000 units or more of penicillin not less than 2 nor more than 4 years prior to time blood was taken.

- Donors with latent syphilis, adequately treated with 4,800,000 units of penicillin.
- Donors with clinical manifestations of late syphilis, such as paresis, tabes, aortic insufficiency, and aneurysm, adequately treated with 4,800,000 units or more of penicillin.
- Donors with late asymptomatic neurosyphilis or unspecified type of neurosyphilis, adequately treated with 4,800,000 units or more of penicillin.
- Donors with manifestations of late syphilis such as aortitis or unspecified type of cardiovascular syphilis, adequately treated with 4,800,000 units or more of penicillin.

#### WITH CONDITIONS OTHER THAN SYPHILIS

- Hospital patients with a variety of diseases or conditions, not receiving antibiotics and having no history or clinical evidence of syphilis.
- Patients 12 years of age or younger with yaws.
- Patients with pinta, below age at which associated syphilis might be expected.
- Leprosy patients not thought to have associated syphilis.

#### BIOLOGIC FALSE POSITIVES

- Patients with reactive nontreponemal tests, at least one nonreactive TPI test, and no clinical evidence of syphilis.
- Patients with reactive nontreponemal tests with no clinical evidence of syphilis and who had no previous TPI test.

#### Complement Fixation Tests

The TPCF I and TPCF II tests were performed according to the techniques described in the SERA study (11), and testing was accomplished at the Venereal Disease Experimental Laboratory, Chapel Hill, N.C.

The tpcf-50 test was performed at the Venereal Disease Research Laboratory in Chamblee, Ga., in accordance with the method described in the Manual of Serologic Tests for Syphilis, 1959 (13). Antigen for this test was furnished by the test author.

The TPI test was performed at the Venereal Disease Research Laboratory as described in the manual and was also referred to as "TPI-200" in the SERA study (11) conducted by the Public Health Service.

The TPCF I, TPCF II, and the TPI results on 1,208 SERA study specimens were taken from the SERA study report (11). The tpcf-50 test was performed at a later date at this laboratory on residuals of these same serums which had not been previously heated or tested and had been stored in the frozen state in tightly sealed containers since the original date of collection and separation of serum. The numbers of these specimens were coded so that the testing activity had no prior knowledge of the results obtained with the tests previously performed in the SERA study. An additional 263 specimens in the presumed nonsyphilitic category, which had not been included in the SERA study, were also tested in the tpcf-50 test. The TPI test was performed on all specimens in this group which were not nonreactive with the tpcf-50 test.

#### Results

The results obtained with the three *Treponema pallidum* complement fixation tests and the TPI test on 326 presumed nonsyphilitic donors are shown in table 1. The reactivity rates of the TPCF I (13.5 percent) and the tpcf-50 (13.8 percent) tests were almost identical, but were almost five times as great as were obtained with the TPI test (2.76 percent). The tpcf-50 test was also performed on an additional 263 specimens in this donor category, which were not included in the SERA study and reactive results were obtained in 15 in-

Table 1. Results of the TPCF tests and TPI test on presumed nonsyphilitics

Test	Nonreactive		Reactive <sup>1</sup>	
	Number	Percent	Number	Percent
TPCF I-----	282	86.50	44	13.50
TPCF II-----	256	78.53	70	21.47
tpcf-50-----	281	86.20	45	13.80
TPI-----	317	97.24	9	2.76

<sup>1</sup> Including weakly reactive.

**Table 2. TPCF and TPI test results obtained on 477 serums from patients in eight categories of syphilis**

Category	Number of specimens	TPCF I		TPCF II		tpcf-50		TPI	
		Reactive <sup>1</sup>		Reactive <sup>1</sup>		Reactive <sup>1</sup>		Reactive <sup>1</sup>	
		Number	Percent	Number	Percent	Number	Percent	Number	Percent
Primary, untreated.....	119	80	67.23	84	70.59	87	73.11	45	37.82
Primary, treated.....	29	11	37.03	15	51.72	16	55.17	6	20.69
Secondary, untreated.....	84	82	97.62	83	98.81	83	98.81	82	97.62
Secondary, treated.....	18	11	61.11	16	88.89	16	88.89	11	61.11
Latent, treated.....	24	20	83.33	22	91.67	19	79.17	22	91.67
Late, treated:									
With clinical manifestations.....	63	54	85.71	56	88.89	55	87.30	62	98.41
With asymptomatic or unspecified neuro-syphilis.....	112	105	93.75	105	93.75	102	91.07	109	97.32
With aortitis or unspecified cardiovascular.....	28	21	75.00	19	67.86	23	82.14	26	92.86

<sup>1</sup> Including weakly reactive.

stances. The TPI test, performed on these tpcf-50 reactive serums, was reactive in two instances, weakly reactive in 1, and nonreactive in the other 12.

In primary syphilis, the tpcf-50 test was the most reactive of the treponemal complement fixation tests, and the TPI test was the least reactive of the four procedures (table 2). In untreated secondary syphilis, all four tests showed a high degree of reactivity, but in treated secondary syphilis, the TPCF II and the tpcf-50 tests were considerably more reactive than either the TPCF I and TPI tests, which gave identical findings. In latent and late syphilis, the tpcf-50 and TPCF I tests

were in close agreement but were consistently less reactive than the TPI test.

Results obtained in four categories of diseases other than syphilis showed the tpcf-50 test to be in closer agreement with the TPI than was the TPCF I test of hospital patients with a variety of diseases having no history or clinical evidence of syphilis (table 3). In yaws and pinta, all four tests were 90 to 100 percent reactive. In a group of 29 patients with leprosy, one reactive result was obtained with both the tpcf-50 and TPCF I tests and two with the TPCF II modification. No reactive results were observed in this group with the TPI test.

**Table 3. TPCF and TPI test results obtained from donors with diseases or conditions other than syphilis**

Category	Number of specimens	TPCF I		TPCF II		tpcf-50		TPI	
		Reactive <sup>1</sup>		Reactive <sup>1</sup>		Reactive <sup>1</sup>		Reactive <sup>1</sup>	
		Number	Percent	Number	Percent	Number	Percent	Number	Percent
Variety of conditions in hospital patients.....	73	8	10.96	11	15.07	6	8.22	5	6.85
Yaws.....	36	35	97.22	35	97.22	36	100.00	36	100.00
Pinta.....	50	46	92.00	46	92.00	46	92.00	47	94.00
Leprosy.....	29	1	3.45	2	6.90	1	3.45	0	0.00

<sup>1</sup> Including weakly reactive.

Table 4. TPCF and TPI test results obtained from donors classified as biological false positive reactors

Category	Number of specimens	TPCF I		TPCF II		tpcf-50		TPI	
		Reactive <sup>1</sup>		Reactive <sup>1</sup>		Reactive <sup>1</sup>		Reactive <sup>1</sup>	
		Number	Percent	Number	Percent	Number	Percent	Number	Percent
Nontreponemal test, reactive, TPI nonreactive	111	11	9.91	14	12.61	10	9.01	5	4.50
Nontreponemal test reactive, no clinical evidence	109	444	40.37	47	43.12	34	31.19	38	34.86

<sup>1</sup> Including weakly reactive.

All of two groups of donors classified as biological false-positive reactors were reactive in one or more nontreponemal tests in the absence of any clinical or anamnestic evidence of syphilitic infection (table 4). In a group limited to patients who were previously nonreactive in at least one TPI test, almost identical reactivity rates were obtained with the TPCF I and tpcf-50 tests (9.91 percent and 9.01 percent, respectively), but these were approximately twice that of the TPI test (4.05 percent). Although it might be expected that the TPI test would be completely nonreactive in this group because of the method of preselection of donors, the five TPI reactions obtained among these patients could be attributed to the fact that the procedure used in screening these patients may have been less reactive than the modification used in this study. Where the biological false-positive diagnoses were made by clinical impression without previous TPI test screening, all four tests were more reactive than among those who were not reactive to the TPI test, possibly due to the presence of syphilis, treated or untreated, in this group of donors. The TPI and tpcf-50 tests, however, were in closer agreement than the other two tests, in this last category.

### Summary

The three TPCF tests and the TPI test were used on serums from donors in selected categories and results compared.

1. In the presumed nonsyphilitic group, the tpcf-50 test and the original TPCF were in close agreement. However, the reactivity rate

of both tests was five times greater than that of the TPI test.

2. In primary and secondary syphilis, the tpcf-50 test was either comparable to or more reactive than the TPCF I and TPI tests, but in latent and late syphilis, with the exception of neurosyphilis, all three TPCF tests were consistently less reactive than the TPI test.

3. In diseases other than syphilis, excluding the treponemal diseases yaws and pinta, the TPI test gave fewer reactions than the three TPCF procedures.

4. In the group of donors preselected by at least one nonreactive TPI test, approximately 5 percent (5 of 106) of the patients who were nonreactive with the TPI test in this study were reactive in the tpcf-50 test.

5. In the group of donors diagnosed as biological false-positive reactors by clinical impression and without previous screening with a TPI test, the reactivity rate was approximately the same with the tpcf-50 and TPI tests.

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## Research Support by Foundations and Health Agencies

During 1957, \$95 million was spent for scientific research and development by private philanthropic foundations and voluntary health agencies in the United States, the National Science Foundation reports. Of 4,067 private foundations surveyed, 438 reported research and development programs and a total outlay of \$72 million. Twenty-five of 30 voluntary health agencies reported expenditures of \$23 million.

Basic research received \$59 million of the total spent. Private foundations gave major support to the life sciences, about 45 percent of their total expenditures; social sciences were next in dollar support; physical sciences received the least. Almost one-half of the expenditures reported by the voluntary health agencies were to support biological and medical research.

Most of the expenditures were in the form of grants to outside organizations and individuals. Educational institutions and affiliated medical schools and hospitals were the major recipients.

These and other findings are a summary of preliminary data compiled for the National Science Foundation by the Bureau of Labor Statistics of the U.S. Department of Labor and published under the title "Research and Development Expenditures of Foundations and Health Agencies, 1957" as No. 15 of the Foundation's series "Reviews of Data on Research and Development."

*Q fever in bovines, present in only 7 States in 1949, is now reported in 35 States. While the incidence of bovine infection appears to be increasing, the extent of transmission to man remains to be determined.*

# Report on the Nationwide Occurrence of Q Fever Infections in Cattle

LAURI LUOTO, D.V.M., M.P.H.

SINCE 1947, Q fever has been recognized as a public health problem in certain areas of the United States, particularly in the Western States. Special investigations have shown that human cases, some of which are severe and protracted, commonly occur in endemic areas in Texas, California, and Idaho. Recent reports (1) indicating that Q fever occurs in other States emphasize the need for further investigation of this infection of animals and man. A systematic study of the infection in livestock and of associated human disease is required to define the problem.

Dairy cattle, which are a major reservoir of infection and thus an abundant potential source of human disease, develop only asymptomatic infections. After the causative agent, *Coxiella burnetii*, is introduced into a herd, many animals develop chronic infections and transmit the agent to other additions to the herd; thus the herd usually remains permanently infected. Sheep and goats also are sources of the disease but are of lesser importance because their more limited distribution results in fewer human contacts. Although infection cycles may occur

among rodents and arthropods in nature, *C. burnetii* maintains an independent and more important airborne infection cycle among domestic livestock. This airborne transmission, along with the hardiness of the agent and its ability to persist in the environment, suggests a propensity for spreading and becoming a widespread public health problem.

Luoto (1) postulates that foci of Q fever occur and are spreading among dairy cattle in many areas of the United States and that the resulting gross environmental contamination will lead to frequent human infection and illness. In order to evaluate the public health significance of Q fever infections a three-phase study is planned: (a) the prevalence of the disease among dairy cattle will be determined by serologic surveys; (b) where foci of Q fever are found, surveys for human infection will be performed; and (c) the surveys will be followed, if indicated, by studies of the disease in man.

This is a report of findings dealing with the distribution, prevalence, and spread of Q fever among dairy cattle.

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*Dr. Luoto is senior veterinarian at the Rocky Mountain Laboratory, National Institute of Allergy and Infectious Diseases, Public Health Service. The laboratory is located in Hamilton, Mont. This is the third of a series of papers by Dr. Luoto on the epidemiology of Q fever in the United States.*

## Method of Study

Information on bovine infection was obtained by cooperative surveys in which State or local health and agricultural groups in 26 States participated. Herd milk specimens and serums ob-



tained by existing collecting agencies, such as mobile brucella test or milk control laboratories, were tested for antibody against *C. burnetii*. Tests of individual samples of milk or serums, isolation of the agent by guinea pig tests, and epizootiological studies were performed when indicated. Results were confirmed and correlated at the Rocky Mountain Laboratory, Hamilton, Mont.

The capillary-tube agglutination test (CAT) was used to detect antibody against *C. burnetii* in milk and various serums (2-4). This test, used in Q fever studies since 1952, has been evaluated by other groups (5,6) and found to be specific, sensitive, and reproducible. A close correlation exists between the presence of the agent in milk and of agglutinating antibody in milk or serum of individual animals.

Recent studies by Tjalma (7) and those to be reported by Luoto and Brock of tests performed during 1958-59 in Montana and Idaho indicate the reliability of the method for

testing pooled milk from entire herds; a positive result indicates the presence of one or more infected animals within the herd. Other studies by Krumbiegel in Wisconsin and Stoenner in Idaho during 1957-59 demonstrated that 79 to 84 percent of milk samples positive in the CA test yielded *C. burnetii* when inoculated into susceptible animals. The percentage of isolations increased directly with the titer of pooled milk, but the agent was not isolated from CAT-negative herd milk. While the exact sensitivity of this method for detecting infected animals within herds is uncertain, the test works effectively under field conditions. Infected herds and animals are being detected in areas where rates of infection among individual cows are only a fraction of 1 percent.

#### Distribution and Prevalence

Data now available demonstrate conclusively that Q fever occurs among dairy cattle in all parts of the United States. Bovine infections

Figure 1. The known distribution of naturally occurring Q fever infections in the United States

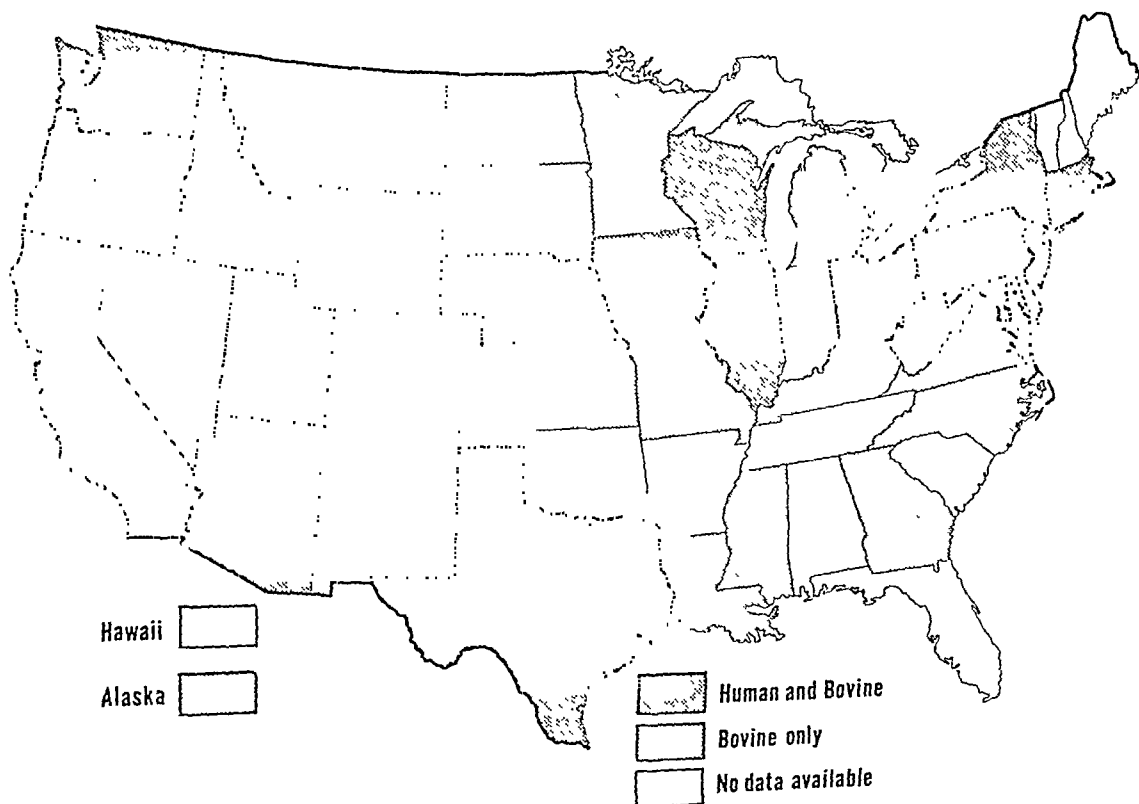
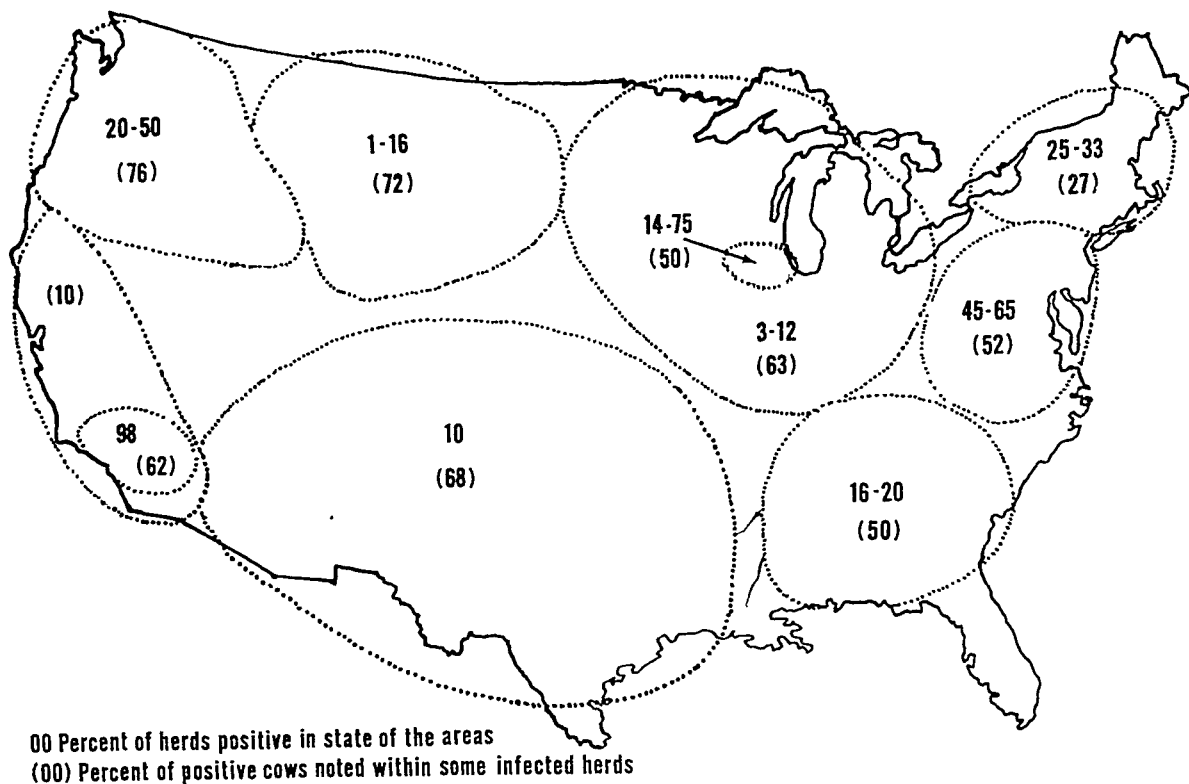


Figure 2. Prevalence of Q fever infection among dairy cows and herds in areas of the United States



have been demonstrated in 35 States (fig. 1) and have been found recently in all States where a concerted search has been made. Earlier studies indicated that bovine infections were frequent in seven States; namely, California, Wisconsin, Ohio, Iowa, Texas, Arizona, and Idaho (6-13). The current surveys in 26 States of 24,551 herds including 353,905 cows confirm and expand earlier findings in some areas and prove the occurrence of considerable bovine infection in 19 additional States—Oregon, Washington, Montana, Wyoming, Utah, South Dakota, Minnesota, Nebraska, Illinois, Michigan, Georgia, North Carolina, Maryland, Pennsylvania, New Jersey, New York, Connecticut, Massachusetts, and Hawaii. Other, more limited, data suggest that bovine infection occurs in nine other States; namely, Louisiana, Mississippi, Virginia (14), Colorado, New Mexico, North Dakota, Kansas, Missouri, and Kentucky (15). It is likely that infections occur in the remaining 15 unstudied States, most of which are adjacent to or surrounded by infected areas.

An unexpectedly high herd infection rate was encountered in most sections of the country, ranging from 1 to 65 percent within the various States (fig. 2). The finding of high levels of infection among dairy herds along the supposedly infection-free eastern seaboard is of special interest. Wide distribution of foci and variation in prevalence of infection was apparent. Within States having even the lowest rates, up to 14 percent of the herds in some areas were infected. Nearly 100 percent of the herds were infected in areas having more widespread infection. In Wisconsin, with a 7.7-percent herd infection rate, 75 percent of the herds were positive in some counties (9).

Not only were herd infections widespread, but a high percentage of infection occurred among animals within herds (fig. 2). Studies of several hundred cows within a dozen herds in each of several parts of the country revealed that over 50 percent of the animals within some herds are positive. Such levels of infection also exist among cows in focal areas where herd infections are infrequent. In Montana, with only

tained by existing collecting agencies, such as mobile brucella test or milk control laboratories, were tested for antibody against *C. burnetii*. Tests of individual samples of milk or serums, isolation of the agent by guinea pig tests, and epizootiological studies were performed when indicated. Results were confirmed and correlated at the Rocky Mountain Laboratory, Hamilton, Mont.

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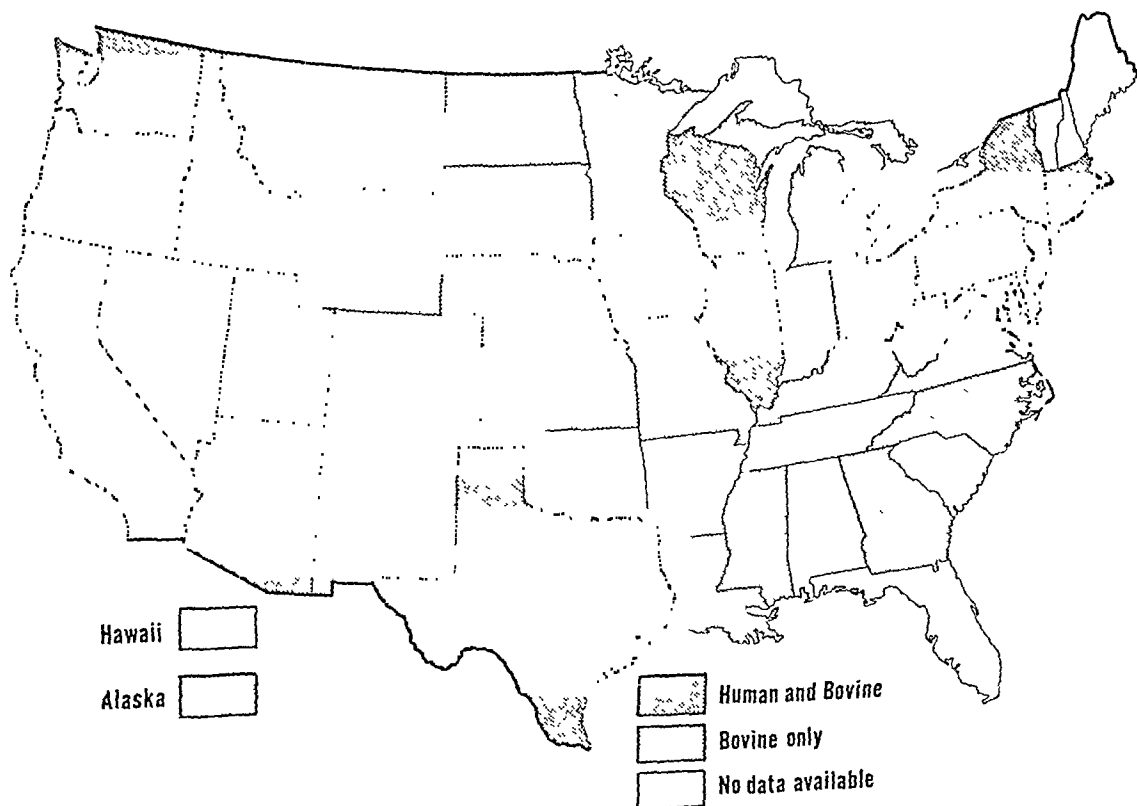
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Data now available demonstrate conclusively that Q fever occurs among dairy cattle in all parts of the United States. Bovine infections

Figure 1. The known distribution of naturally occurring Q fever infections in the United States



previously had no evidence of infection (15) but now have from 20 to 65 percent of the herds infected. A recent resurvey of a large Iowa milkshed by Tjalma showed a 100 percent increase in herd infections over that detected a year earlier (5); a similar increase is being observed by Krumbiegel among herds being resurveyed after 2 years in a Wisconsin milkshed.

Specific studies of the spread of infection among cattle, currently underway in Montana and Idaho, indicate that Q fever is spreading in these rural areas (table 2). Montana, which was considered previously to be free of bovine infection (3), now has infection in 1.2 percent of the 5,536 dairy herds tested. Infections increased from 2.2 to 4.3 percent, or from 19 to 34 herds among 852 herds resampled in 3 counties during a 5-month period of 1959 according to unpublished survey data. Within the same period, infections of individual cows increased from 9 to 17 among 32 animals in 2 herds observed. Similar studies by Brock in a heavily infected area of western Idaho show that during a 5-month period, herd infection more than doubled, from 42.3 to 90.1 percent, among 99 grade A herds resampled. The spread of herd infection was not uniform within the same or different areas.

Thus, infection has been shown to be spreading under rural conditions in at least 13 States, regardless of the prevalence of bovine Q fever. While the prevalence and rate of spread appear directly related to concentration of dairy cows, undoubtedly other unknown factors are involved.

### Correlation With Human Infection

As could be expected, human infections occur and are diagnosed in areas where Q fever is known to exist in animal reservoirs. As the result of special interest and studies, Q fever is already recognized as a public health problem in some areas. At least 300 human cases were detected in southern California (17), and 350 cases were associated with sheep in northern California (18), during epidemiological studies in 1948-49. Additional cases are encountered annually. Cases originating from cattle or sheep have been recognized for many years in Texas and south central Idaho where epidemics

were studied in 1947 and in 1958 (19,13). Ten proven cases and evidence of infection in 85 individuals were found in Iowa by Tjalma where only 3 percent of dairy herds are infected. Human infection has been reported from 18 of the 35 States with known infected cows; an occasional human case is diagnosed in four "newly" infected States, namely, Maryland (20), Pennsylvania (21), New York, and New Jersey.

The true incidence of human infection, or of disease, within the United States is unknown because many cases are unrecognized. Even during the recognized epidemic in Idaho during 1958, most of the 93 laboratory-confirmed cases reported were diagnosed by about 10 percent of the local physicians, many of whom had diagnosed cases in previous years.

### Significance of Findings

The demonstration of widespread bovine infection indicates that Q fever is endemic throughout the United States and that a nationwide problem already exists. The spread of infection even under dispersed rural conditions, as in Montana, sometimes occurs with rapidity and is a matter for concern. Universal bovine infection, similar to that in southern California where 98 percent of the herds are infected, may develop in other parts of the country. Such conditions are already approached in Western States, in Wisconsin, and in several Eastern States. The continuing growth of human and animal populations will result in crowding conditions even more conducive to spread of infection. Continued surveillance will indicate the development and scope of the animal disease problem.

In view of the widespread prevalence of bovine Q fever throughout the United States, information on associated human infections is urgently needed. Q fever is already a public health problem where the disease is endemic, with epidemic outbreaks, but the true magnitude of the problem in the United States remains to be determined. In many respects the failure to recognize Q fever in man is similar to the situation existing when brucellosis in man was first associated with a disease of cattle. From present knowledge concerning Q fever, it is difficult to conceive how infections

**Table 1. Recent observations on the prevalence and spread of Q fever among dairy herds**

Region	1948-52		1958-59	
	Number tested	Percent positive <sup>1</sup>	Number tested	Percent positive <sup>1</sup>
Idaho, south-central-----	438 herds-----	1.0	751 herds-----	17.0
Eastern States-----	179 herds-----	<1.0	248 herds-----	47.0
Mountain States-----	900 serums-----	<1.0	315 serums-----	30.0
	364 herds-----	0	5,536 herds-----	1.2

<sup>1</sup> Early tests were done by complement fixation, except for group 1 milks, tested by guinea pig tests, and the 364 herds in group 3, by capillary test. All recent tests used the capillary method.

1 percent of the herds infected, up to 72 percent of the cows within infected herds were positive.

These data on the distribution and prevalence of bovine infection have been extracted largely from reports of participating groups. Detailed reports on studies within individual States will appear elsewhere. In confirming the findings of various investigators, isolations of the agent were made from milks collected in 10 "newly" infected States. Current information indicates that *C. burnetii* is already well-seeded among dairy cattle in all parts of the country.

#### Spread of Infection Among Bovines

Reports in the literature suggest spread of infection among bovines in California, Wisconsin, Ohio, and Iowa (9,10,16). Recent unpublished observations on the prevalence of bovine infection constitute more conclusive evidence of

the spread of Q fever (table 1). These studies were done by CAT procedures while the earlier observations, except for the 364 herds from a mountain State, were based on guinea pig or complement fixation tests. The results are comparable, however, since the sensitivity of these test methods for detecting infections is quite similar (2, 3). These findings indicate that dairy herd infections in south central Idaho increased from 1 to 17 percent from 1951 to 1958 (13). A great increase occurred in an Eastern State where evidence of bovine infection was not detected in 1949, a little was present in 1952, but 47 percent of 248 herds tested were infected by 1959. Luoto and Stoenner have found that bovine infections increased appreciably in two mountain States between 1952 and 1958 (table 1). Other similar but perhaps less valid observations, because of inadequate baselines of infection, suggest that bovine Q fever is increasing in five Eastern States which

**Table 2. Increase of Q fever infection observed among dairy herds in Montana counties and Idaho plants**

Site	Montana			Idaho		
	Total tested	Number positive January 1959	Number positive May 1959	Total tested	Number positive October 1958	Number positive March 1959
Total-----	852	19	37	99	42	90
A-----	152	8	18	48	15	43
B-----	316	6	11	25	9	21
C-----	384	5	8	26	18	26
Percent positive-----		2.2	4.3		42.3	90.1

NOTE: Positive indicates herd milk reacted in capillary-tube agglutination test on whole milk.

# METROPOLITAN HOSPITAL PLANNING



## CONFERENCE REPORT

**H**AS the time come for the Hill-Burton hospital and medical facility construction program to place more emphasis on the needs of the Nation's metropolitan centers?

This question was given serious consideration at a Conference of the Surgeon General with State and Territorial Hospital and Medical Facilities Survey and Construction Authorities held in Washington, March 9-11, 1959.

Hill-Burton State agency chiefs agreed that more attention should be directed to the growing dilemma facing metropolitan areas. The degree of emphasis, however, remained unsettled. General concepts evolved from the discussion were:

1. Urban hospital and medical facilities should be expanded in an orderly and coordinated manner.
2. Rural areas are not without medical facility problems, therefore continued attention should be given to their needs.
3. Geographic regions should be examined in order to view the problems of both metropolitan and rural areas in their proper perspective.

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*Prepared by John D. Theulis, chief of the Operations Branch, Division of Hospital and Medical Facilities, Public Health Service.*

The conferees, in examining the problems of metropolitan hospitals, found that the chief complaint appeared to be insufficient funds for necessary construction. The complaint is chronic and widespread and extends even to hospitals in smaller communities. It is the result of many factors.

Many of our older hospitals were built without future needs in mind and grew as money became available to meet a recognized local need. Little or no thought was given to coordination of medical and hospital facilities to serve communities efficiently and economically. Many now obsolete hospitals, built 50 or more years ago, find that replacement would be more economical than modernization of the existing building.

Advances in medical science and technological progress have resulted in the need for new and costly equipment as well as changes in architectural design of facilities.

Socioeconomic, cultural, and demographic changes in our society have resulted in a shift of medical needs. The longer lifespan of the population and the growth of suburbs are among the many trends affecting medical needs unforeseen prior to the thirties when many metropolitan hospitals were built.

in man, perhaps even now occurring unrecognized, can fail to become even more widespread.

Regardless of any future implications, the presence of *C. burnetii*, a known pathogen, in animals and their products or environment presents situations which must be faced by responsible agricultural, industrial, and public health groups. Only through coordinated studies by many groups will data become available for evaluation of the problem. Public relations problems arise. Recognition and reporting of human infection should be promoted. Educational, diagnostic, and epidemiological services must be provided, along with possible regulatory and control measures.

### Summary

Bovine Q fever must now be considered endemic throughout the United States, since infections are widespread and occur in all 35 States recently studied. Such infections are not only prevalent among cattle, sometimes to an alarming degree, but they are increasing and spreading even in rural areas. The spread of infection is expected to continue and may even accelerate in the future.

Human disease contracted from livestock is already a public health problem in some areas and is being recognized in others previously considered to be free of infection. Unrecognized human disease may occur in areas now known to contain endemic bovine infection.

Concerted nationwide studies of the occurrence and epidemiology of the disease are needed to define factors bearing on its occurrence and spread. Stimulation of the recognition and study of Q fever in man is necessary to ascertain the existence or possible development of a disease problem.

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if urban hospitals are to maintain leadership in providing quality medical care, teaching, and research.

Gordon R. Cumming, of Berkeley, Calif., told the group that there is nothing "special" about metropolitan area planning. He suggested that "we must concentrate on the cities or the sub-orbits within them rather than plan grossly for a big group of 10 million people." He added that there is a surprising amount of useful information available about population trends, highway programs, and other such data needed in planning for the future. Referring to a study of the Los Angeles area, Cumming stated that "in tackling its planning, Los Angeles pegged the date 1975 toward which to build."

"As a second principle used in this study," Cumming stated, "we considered people and geography and distance and relationships, and evolved a concept of a central hospital service area and suburban areas, taking into account several characteristics. In each of the 14 hospital service areas, we defined the metropolitan community and where there should be a center with a community identity. Each of these areas have or will attain a population of at least 250,000 people by 1975.

"Third, we assumed the proposed traffic patterns for the future would persist. We'll still have traffic congestion in 1975, and we should plan for hospital services within about one-half hour's travel time. You can't travel very far even on a super-freeway in half an hour, if you count the time on a portal-to-portal basis.

"Finally, we asked what kind of institutions should serve these people and this geography? At first we thought of 200 beds as a minimum for a hospital, but upon the advice of people in the hospital field, this figure was reduced to 150."

The question of priorities (rural vs. metropolitan areas) was discussed by Dr. John R. McGibony, of Pittsburgh, Pa.

McGibony recalled that in the early days of the Hill-Burton program, considerable emphasis was placed on the needs of rural areas. He added that the time has now come "for us to direct more of our efforts toward meeting the needs of the urban, metropolitan areas."

In reviewing the approach taken in the theoretical blueprint of a coordinated system of hospitals, McGibony indicated there might have been more strength in such a system if the hub had been stronger. "The satellite facilities might have been stronger with a stronger central tie," he said.

McGibony noted that not enough emphasis has been placed on some factors in rising hospital costs. Referring to a recent article by Pat Groner, of Pensacola, Fla., he pointed out that the increase in use of existing X-ray facilities and laboratory services account for probably one-third of the increasing cost of hospital care, and that another one-third could be accounted for by other adjunct facilities and services.

"In meeting the demand," McGibony observed, "we tend to lose sight of the quality of care. If this is not a major item in planning, then most of the planning will go for naught, whether for diagnosis and therapy, prevention in both its primary and secondary aspects, or restoration or rehabilitation."

McGibony added that despite the fact that perhaps one-third of the internships and residencies in this country are served in non-primary university-connected hospitals, the urban metropolitan hospital complex is the seed of education for the health profession. Certainly a majority of the clinical and related research is in that setting, he said, and such education leads directly to the supply of personnel for satellite facilities.

On fund raising, McGibony said that industry will contribute as a general rule about 50 percent of the total capital outlay for an institution. He added that metropolitan, urban, and rural planning has to be a combined responsibility of all voluntary and governmental agencies.

"Hospital councils are meeting this need," he continued. "In Pittsburgh we have more than 60 hospitals working together closely in the improvement of care, services, and planning."

Ralph Murphy, of Baltimore, Md., placed special emphasis on the problem of obsolescence in metropolitan area hospitals. However, he said that there is much more to a



The conferees suggested that a major step toward aid to hospitals would be establishment of planning agencies on a permanent basis for each metropolitan area.

Remarks by George Bugbee, president of the Health Information Foundation of New York City, set the pattern for the panel discussion that followed. Other members of the panel, which was moderated by Dr. Robert N. Barr, secretary and executive officer of the Minnesota Department of Health, were: Gordon R. Cumming, chief of the bureau of hospitals, California State Department of Public Health; Dr. John R. McGibony, professor of hospital and medical administration, Graduate School of Public Health, University of Pittsburgh; Ralph Murphy, executive director of the Hospital Council of Baltimore, Md.; and Dr. Helen Knudsen, director of the hospital services division, Minnesota Department of Health.

Bugbee, who played an important role in the development of the Hill-Burton Hospital Survey and Construction Act, emphasized that the program provided an incentive for developing more adequate hospital and medical care in this country, adding:

"There has been general acknowledgment and approval of the act both in serving its purpose and in its administration. As with any national program, there is continued need for reevaluation of operating principles. Currently, there is considerable concern about whether the act and the priorities it established now permit the granting of funds for facilities where they are most needed in every State."

Referring to the need for replacement of older hospitals which have been leaders in quality in metropolitan centers, he said that several years ago the American Hospital Association estimated that such replacement would cost in excess of \$1 billion.

"Our oldest, largest, and finest general hospitals are located in cities," he said. "Evidence of the quality of patient care, teaching responsibilities, both graduate and postgraduate, and research, shows that these hospitals are our most important resources in maintaining and raising the quality of hospital and medical care nationwide."

While emphasis under the Hill-Burton pro-

gram has been directed to rural needs, a relatively large proportion of funds has gone to larger centers of population. This is supported by Bugbee's analysis of Hill-Burton grants from 1947 through the end of 1958. Grants during this period totaled \$1,091,801,000. He said that 45.7 percent of these funds was expended for all types of hospital and medical facilities in standard metropolitan areas where 56 percent of the Nation's total population lives. Central cities in these standard metropolitan areas which have 33 percent of our total population received 32 percent of the allocations. General hospitals have received 82 percent of all Hill-Burton funds, or a total of \$895 million since passage of the act; 43 percent of this amount was earmarked for standard metropolitan areas and 29 percent for central cities within these areas.

Explaining that he did not intend to evaluate urban needs with a view toward shifting priorities, Bugbee pointed out that only with adequate planning can priorities be applied intelligently. There is currently a great upsurge in demands for better metropolitan planning, he emphasized.

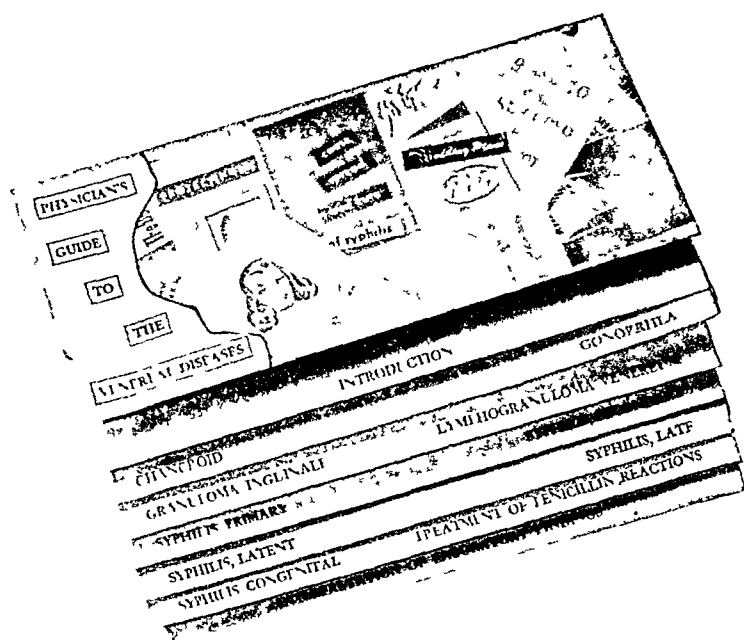
Suburban growth was cited by Bugbee as a big complication. He noted that population shifts to the suburbs have changed the texture of the central city population and its ability to finance hospital care, resources available for capital fund raising, and distribution of physicians.

A community planning agency should be independent of other community organizations, Bugbee suggested. He explained that "The agency must be representative of the community. Its active members, particularly, should be selected for their objectivity, community-mindedness, and, in the instances that apply, for their sense of responsibility in raising funds. It would be desirable if the agency would be designated by the State planning agency as its affiliate organization in the metropolitan center. Planning is not a temporary function—the agency must be set up on a relatively permanent basis."

Another point emphasized is the need for further research to aid in establishing more definitive goals. This, Bugbee said, is essential

the detriment of rural areas, the conferees agreed that planning is just as important in the large communities as it is in the smaller communities and the problems are just as great in one area as in the other. It was emphasized that one of the greatest strengths of the Hill-Burton program has been central planning for the whole State. Further, that, while the needs of metropolitan areas could be emphasized more and more in future planning, this need

probably should be developed jointly by local planning groups with participation and direction on the part of the State Hill-Burton agency. Experience indicates that no one area of a State can and should plan independently of other areas. The conferees agreed that the success of the Hill-Burton program justified the role of a statewide planning agency in any future efforts to meet the hospital and medical facility needs of all segments of the population.



HEALTH  
EDUCATION  
CASE  
HISTORY

lymphogranuloma venereum, syphilis (primary, secondary, latent, late, congenital), treatment of penicillin reactions, and interpretation of laboratory findings. The subjects are printed on the projecting margin of the page (see illustration).

The brochure, in addition to explaining diagnostic and therapeutic processes, points out the necessity of joint responsibility of the private physician and the public health department in the control of these diseases and discusses the services and facilities of the department that are available to the private practitioner. The pamphlet was presented in connection with a seminar held in Washington in October 1959 in cooperation with the Public Health Service. It is being distributed on a continuing basis to all physicians in private practice in the District.

### *Guide to Venereal Diseases*

An unusually well-designed information piece, *A Physician's Guide to the Venereal Diseases*, has been printed by the preventable and chronic diseases division of the District of Columbia Department of Public Health, which gives its ad-

dress and telephone number, with the date of publication on the back. The pages are folded horizontally so that each one successively projects enough to provide a ready index to the subjects treated: chancroid, gonorrhea, granuloma inguinale,

hospital than the excellence of its physical facilities. "While physical facilities are important in a very real sense," he said, "the excellence of a hospital depends upon the people and staff." As an example, he stated that patients in pre-1900 beds do not necessarily receive poorer care than those in newer beds.

Murphy added that one of the major needs in metropolitan planning is to deal realistically with the problem of obsolescence. Furthermore, it is necessary to face up to the economics of the problem—especially as it relates to replacement versus modernization. This requires the development of measures of obsolescence which are realistic and meaningful to both the community and the hospital involved. Murphy explained that the position taken by the individual hospital regarding obsolescence is usually based upon its own situation and does not always correspond to the community viewpoint.

Murphy said it is agreed that the ring of very small hospitals in the suburbs is to be avoided. However, people are not reassured by statistics indicating that less than 1 percent requires a hospital within the first 10 minutes after an emergency. Therefore, suburban hospitals which are desirably sized and staffed are a vital component of the overall plan for adequate hospital service in a metropolitan area.

Agreeing with the need for additional research, Murphy pointed out that current planning must be based on the knowledge we have. He observed that frequently maximum use is not made of the vast amount of data already gathered.

Added to the obstacles facing hospital planners are the unpredictable and intangible factors which should be considered. An example is estimates of population growth. The erroneous predictions made by the demographers in the thirties could easily be repeated.

Two conclusions, based on the fact that hospital planning still is an inexact science, were drawn by Murphy. First, he said, planning must be flexible. Second, plans should be based on the needs and past experience of an individual community. He warned against the inadvisability of one community adopting plans which were devised to meet the needs of a different type of community.

Dr. Helen Knudsen, of Minneapolis, Minn., told of problems encountered in two metropolitan areas, Minneapolis and St. Paul, existing side by side, but operating independently. She said that assistance had been given Minneapolis in surveying needs as preparation for a united hospital fund raising drive. On the other hand, St. Paul does not have a planning group, each hospital raising its own funds.

"We're very concerned in our office," Knudsen said. "We have attempted for some time to persuade St. Paul authorities to organize an overall planning group."

The difficulties of hospital planners are not confined to metropolitan areas, Knudsen said, citing the real problem in rural development. She noted that at one time or another, practically every town in Minnesota has discussed construction of a community hospital, whether it needed a hospital or not. "I'm sure we can say that we spend as much time trying to discourage some of these smaller communities from building as we do trying to encourage others to plan and raise funds," she said.

However, after the would-be sponsors of a community hospital are convinced that it is not justified, they become very realistic and grateful for the advice, she added. Instead of building a hospital, the sponsors may build a clinic more suited to their needs.

"The Minnesota State Board of Health has now adopted a policy requiring every applicant to submit a realistic plan for staffing before Hill-Burton money will be allocated," Knudsen said.

During the general discussion, attention was again given to the question of emphasis in the Hill-Burton program. Reference was made to the statistics cited by Bugbee that since 29 percent of Hill-Burton funds were allocated to central cities where 33 percent of the population lives, the needs of our large areas have not been disregarded "by any manner of means."

It was emphasized that much credit is due to State agencies for planning their programs in such a way that, while taking care of the peripheral needs, and the needs of rural areas, a good job has been done in the central cities.

While they cautioned that attention should not be directed to the needs of urban areas to

Table 3. Strontium 90 content of fresh vegetable samples, by State, 1958-59<sup>1</sup>

Product	State of origin	Total beta radioactivity <sup>2</sup> in micromicrocuries per kilogram	Strontium 90	
			Micromicrocuries per kilogram	Percent of total beta
Cabbage	California	( <sup>3</sup> )	2.0	-----
Cabbage	California	910	5.1	0.55
Celery	California	4,180	3.4	.08
Celery	California	4,670	3.4	.07
Lettuce	California	1,840	17	.92
Lettuce	California	3,910	5.4	.14
Lettuce	California	6,490	14	.22
Potatoes	California	( <sup>3</sup> )	.5	-----
Cabbage	Ohio	( <sup>3</sup> )	7.2	-----
Potatoes	Ohio	( <sup>3</sup> )	7.3	-----
Potatoes	Texas	( <sup>3</sup> )	3.2	-----
Cabbage	Minnesota	( <sup>3</sup> )	8.8	-----
Cabbage	Illinois	( <sup>3</sup> )	14	-----
Potatoes	Illinois	( <sup>3</sup> )	1.8	-----
Potatoes	Maryland	( <sup>3</sup> )	5.1	-----
Cabbage	Kansas	( <sup>3</sup> )	6.4	-----
Potatoes	Kansas	( <sup>3</sup> )	3.3	-----

<sup>1</sup> Samples examined by the Lamont Geological Observatory, Palisades, N.Y., under a cooperative Food and Drug Administration-Atomic Energy Commission program.

<sup>2</sup> Less that due to naturally occurring potassium 40.

<sup>3</sup> Not available.

tables so far analyzed for this nuclide ranged from 0.5 micromicrocurie per kilogram for potatoes from California to 16.8 for lettuce also grown in California (table 3). Other States covered in the strontium 90 analyses so far completed include Maryland, Kansas, Ohio, Texas, Minnesota, and Illinois.

The National Committee on Radiation Protection and Measurements has recommended 80 micromicrocuries of strontium 90 per liter of liquid or kilogram of solid food as the maximum permissible level, for human consumption, in the diet over an entire lifetime. These levels may be exceeded by varying amounts for varying periods without causing appreciable harm to the individual.

The Food and Drug Administration pointed out that an additional safety factor is provided by the washing, peeling, and trimming which is a normal part of preparation of vegetables either by the housewife or by the commercial processing plant. However, it is not yet known whether some vegetables have a greater affinity for strontium 90 than others.

Total radioactivity and strontium 90 contents of vegetables examined to date are far below the results reported in August 1959 for

alfalfa hay. Average total radioactivity for the hay samples was 27,200 micromicrocuries per kilogram, and strontium 90 content ranged as high as 804 micromicrocuries per kilogram.

Alfalfa hay, however, is primarily animal feed rather than human food and the amount of strontium 90 appearing in milk is considerably less than the amount in the cow's diet.

Of the 14 States from which alfalfa hay was sampled, 13 were included in the vegetable samplings. There was considerable overlapping in the time intervals covered by the samplings. The alfalfa samples in every instance showed significantly higher radioactivity on the average than the vegetable samples from the same States. Ensilage samples were found to contain less total radioactivity than alfalfa hay, but in most instances more than the vegetables from the same State.

Reasons for the differences observed between alfalfa hay, ensilage, and vegetables are not as yet known, but presumably may include such variables as moisture content of the crop, length of growing season, climatic factors, and differences in plant metabolism.

In the Food and Drug Administration survey of human food and animal feeds, the beta

# Radioactivity in Fresh Vegetables

**T**HE Food and Drug Administration's second report on radioactivity in fresh vegetables finds the amount still well within limits recommended by the National Committee on Radiation Protection and Measurements. The report covered 402 samples collected in the latter half of 1958 and 139 collected in 1959. Specimens included cabbage, cauliflower, celery, beans, broccoli, brussels sprouts, collards, beet tops, lettuce, kale, mustard greens, parsley, potatoes, tomatoes, peppers, spinach, turnip greens, and watercress (table 1).

The highest average total beta radioactivity found for any vegetable so far examined was 6,700 micromicrocuries per kilogram of a sample of spinach. The average for all vegetable samples from all sources was 2,520 micromicrocuries per kilogram. The highest single value of total radioactivity was 56,000 micro-

microcuries per kilogram obtained on a sample of spinach from Illinois (table 2). (One micromicrocurie is a radioactivity of an average of 2.2 disintegrations per minute.)

Samples of certain U.S. staple foods are sent by the Food and Drug Administration to the Lamont Geological Observatory for strontium 90 analysis. Strontium 90 contents of vege-

**Table 1. Total beta radioactivity<sup>1</sup> of fresh vegetable samples, by product, 1958-59**

Vegetable	1958		1959	
	Number of samples	Average micromicrocuries per kilogram	Number of samples	Average micromicrocuries per kilogram
Beans.....	38	590	4	430
Cabbage.....	77	500	21	240
Cauliflower, broccoli, and brussels sprouts.....	44	770	17	160
Celery.....	61	3,550	23	4,100
Greens <sup>2</sup> .....	8	2,860	18	1,550
Lettuce.....	76	2,680	29	4,270
Parsley.....	3	7,270	1	4,270
Potatoes.....	9	1,050	3	430
Spinach.....	60	6,820	21	6,360
Tomatoes and peppers.....	26	190	2	0
Totals and averages.....	402	2,450	139	2,860

<sup>1</sup> Less that due to naturally occurring potassium 40.

<sup>2</sup> Includes kale, collards, turnip greens, sugar beet tops, watercress, and mustard greens.

**Table 2. Total beta radioactivity<sup>1</sup> of fresh vegetable samples, by State, 1958-59**

State	Number of samples	Micromicrocuries per kilogram	
		Average	Range
Alabama.....	2	530	0- 1,070
Arizona.....	9	430	0- 960
Arkansas.....	3	11,030	7,060-13,460
California.....	184	4,960	0-21,620
Colorado.....	61	1,130	0-11,710
Delaware.....	1	360	-----
Florida.....	21	1,000	0- 4,450
Illinois.....	23	4,060	0-56,000
Indiana.....	9	620	9- 1,800
Iowa.....	2	400	50- 750
Kansas.....	3	330	185- 550
Kentucky.....	3	1,430	0- 2,540
Louisiana.....	4	220	0- 600
Maine.....	6	540	50- 1,250
Maryland.....	16	1,650	0- 9,750
Massachusetts.....	6	220	41- 360
Michigan.....	31	370	0- 7,800
Minnesota.....	3	0	0- 80
Mississippi.....	3	1,120	77- 1,750
Missouri.....	10	1,970	0- 6,910
Nebraska.....	5	9	0- 220
New Hampshire.....	5	150	14- 390
New Jersey.....	44	1,160	18-20,120
New Mexico.....	9	1,090	113- 4,760
New York.....	28	600	0- 3,130
North Carolina.....	9	960	68- 7,300
Ohio.....	21	540	0- 2,250
Oklahoma.....	1	140	-----
Oregon.....	5	550	185- 1,300
Pennsylvania.....	2	520	500- 550
Tennessee.....	7	2,750	297- 5,960
Texas.....	6	170	0- 510
Utah.....	1	280	-----
Virginia.....	26	2,000	0- 5,860
Washington.....	9	700	0- 2,710
West Virginia.....	6	120	0- 370
Wisconsin.....	3	0	0- 45

<sup>1</sup> Less that due to naturally occurring potassium 40

# Morbidity and Mortality Characteristics of Asian Strain Influenza

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**D**URING the fall of 1957 acute respiratory disease occurred in epidemic prevalence in the greater Kansas City area. The clinical and epidemiological picture of illnesses was typical of influenza. The majority were influenza-like, characterized by a sudden onset of fever, headache, malaise, sore throat, coryza, cough, and muscular aching. The outbreak was explosive, disseminated rapidly through the population, and caused high attack rates among persons of all ages. The number of deaths, particularly deaths attributed to pneumonia, increased.

The outbreak was first noted in September 1957 in the southwest section of Kansas City, Mo., where an abrupt rise in absenteeism from respiratory disease was reported from Southwest High School. The disease then appeared in other high schools in the city. The daily rate of absenteeism reported from five high schools during the epidemic period varied from 11 to 38 percent. The usual daily absenteeism had been less than 5 percent. Approximately 4 weeks following the high school outbreaks, a

marked rise in absenteeism was reported in the grammar schools. Inquiries made of four elementary schools on October 15 indicated rates of absenteeism ranging from 33 to 67 percent. There was an abnormal incidence of respiratory infections among workers in various industries in Kansas City, with the peak incidence occurring during the middle of October.

Most of the influenza-like illnesses observed during the epidemic period were probably Asian influenza. This assumption was reflected by the results of etiological studies performed on throat washings (or swabs) and on acute and convalescent serums obtained from several groups of patients with influenza-like illnesses. The specimens came from four principal sources: high school students, student nurses seen at the student health service of the University of Kansas Medical Center, patients seen in offices of private physicians, and patients in various Kansas City hospitals.

An influenza virus which was antigenically related to the Asian strain (A2/Japan/305/57) was recovered from 41 of 75 patients (55 percent) by inoculation of throat washings into the amniotic cavity of 12-day-old embryonated eggs. Acute and convalescent serum samples from 18 of 32 patients showed a fourfold or greater rise in hemagglutination-inhibition antibody titers, with the A2/Japan/305/57 strain of virus used as the antigen. Thirty of the 75 patients from whom throat washings were obtained were seen at the student health service where a separate study on influenza was conducted. Twenty-two of them (73 percent) with illnesses diagnosed clinically as influenza

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*This study was supported in part by a grant from the Common Cold Foundation to the University of Kansas School of Medicine.*

particles are detected by an instrument which determines the presence of beta radioactivity from all elements, including those which occur in fallout, as well as those in nature, such as potassium 40.

In order to measure beta radioactivity values that relate to fallout only, allowance must be made for this ubiquitous species of potassium. All total beta radioactivity values reported in the survey have therefore been adjusted by subtracting an amount attributed to potassium 40.

The significance of a total beta radioactivity value is determined by the age of the sample. A sample may be extremely radioactive immediately after exposure to fresh products of a fission reaction, but within a few days it will lose that proportion of radioactivity produced by short-lived nuclides. With time, the proportion of beta radioactivity due to strontium 90 and cesium 137 increases, while total radioactivity declines. Half the radioactivity of strontium 90 and cesium 137 is discharged in about 30 years.

## WHO Fellowships for Foreign Study

At the request of the United States Government, the World Health Organization has provided a limited number of short-term fellowships in 1960 for the "improvement and expansion of health services."

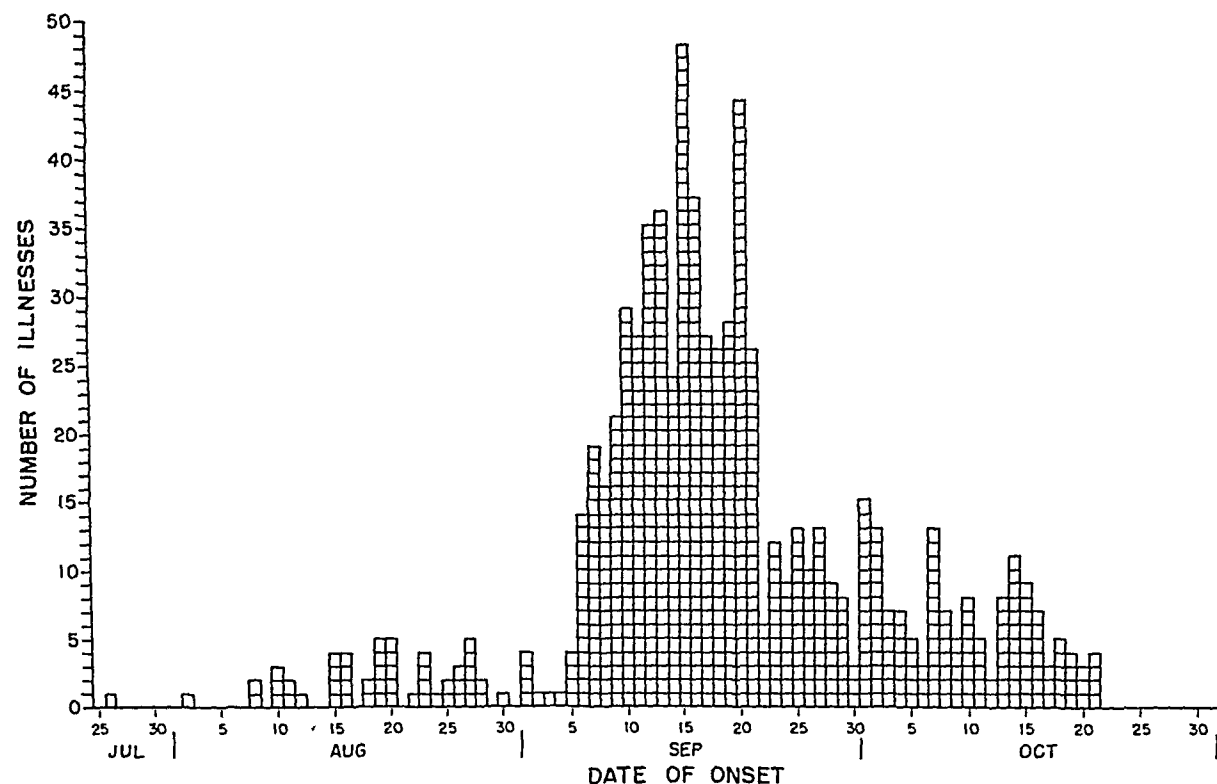
The World Health Organization Fellowship Selection Committee, recently established by Surgeon General Leroy E. Burney, is chaired by Assistant Surgeon General David E. Price. Dr. John Parks, Dr. Fred L. Soper, and Miss Julia Thompson, represent the Association of American Medical Colleges, The American Public Health Association, and the American Nurses Association on the committee.

Applications for fellowships in various branches of public health and allied fields will be considered. Applicants must be engaged in full-time public health or educational work. In making selections, the committee will consider the ability of the individual and the importance of the contribution which his foreign study will make on his return.

Fellowships will pay per diem and transportation and, except in very unusual circumstances, will cover from 2 to 6 months. Employers will be expected to endorse applications and to continue salary payments for the duration of fellowships.

The deadline for the receipt of applications has been extended to March 15, 1960. Further information and application forms may be obtained from Dr. Howard M. Kline, Secretary, World Health Organization Fellowship Selection Committee, Public Health Service, Washington 25, D.C.

Figure 1. Incidence of influenza-like illness by date of onset in 745 students of Southwest High School, Kansas City, Mo., 1957



1,927 persons reporting having had an influenza-like illness, 84 percent had fever; 73 percent, headache; 77 percent, cough; 63 percent, sore throat; and 61 percent, coryza. A history of chest pain was given by 23 percent. A majority of the illnesses lasted 3-7 days.

The incidence of influenza-like illness (745 cases with date of onset given) reported among the high school students according to date of onset is depicted in figure 1. During August and the first few days of September, there were only sporadic cases. On September 6, the number of cases increased suddenly. The high attack rates were sustained for the next 2 weeks, and then abruptly declined. Although abnormal incidence continued for 3 additional weeks, the number of cases reported were of a much lower order of magnitude.

The epidemic curve describing the occurrence of 776 cases among the family contacts for which a date of onset was given (fig. 2) is similar to that of the high school students except that the ascending limb was less abrupt and the

peak of the curve was broader. While the incidence in the high school had fallen precipitously by September 21, incidence continued to be high among the family contacts and was sustained until October 20, after which it abruptly declined.

Thirty-four percent of the 5,822 persons had influenza-like illnesses. The highest attack rate, slightly more than 50 percent, was observed in children aged 10-19 years (table 1 and fig. 3). Among children under 10 years of age, about one-third experienced clinical infection. About 27 percent of the young adults gave a history of having had an influenza-like illness, while in persons 40 years and older the incidence was 17 percent. There was no significant difference in the sex distribution.

The age-specific attack rates among the students attending Southwest High School were relatively uniform, ranging from 50 to 69 percent. The overall attack rate in this group was 59 percent.

The incidence of influenza-like illnesses



were shown to have had Asian influenza (T. D. Y. Chin and R. A. Jordan, unpublished data).

In addition, lung tissue specimens were obtained at autopsy from 11 patients who had pneumonia. The Asian strain of influenza virus was recovered from eight patients by inoculation of tissue suspension intra-amniotically into embryonated eggs.

The data presented in this report describe the morbidity and mortality observations made during the epidemic. The morbidity study was made on a group of high school students and their families. The mortality observations were limited to the influenza and pneumonia deaths reported in Kansas City, Mo. The data describing the efficacy of immunization with monovalent vaccine (A2/Japan/305/57) in prevention of influenza-like illness have been reported in a separate publication (1).

### Methods of Study

The morbidity studies were carried out on a group of students of Southwest High School and their families. The school is located in an upper middle-class residential neighborhood in the southwest section of Kansas City. It had an enrollment of 2,123 students attending grades 8-12. Morbidity data were obtained from a questionnaire which was designed to determine the extent of the epidemic in the school and the epidemiological characteristics of influenza occurring in the students and all members of their families. The questionnaire requested the usual identifying data, a family roster, names of the school children were attending, occurrence of influenza-like illness since August 15, 1957, date of onset and duration of illness, a checklist of symptoms referable to the respiratory system, and a history of vaccination against influenza.

Each student was given a questionnaire to be completed by or under supervision of a parent, and was instructed to return only one completed form per family. The questionnaires were distributed by classroom teachers on October 22, about 1 month after the peak of the epidemic in the school; the completed questionnaires were returned on October 24.

A few families indicated in the questionnaires

that influenza-like illness had occurred during the last week of July and the first part of August. Therefore, the rates presented in this paper were based on the influenza-like illnesses reported between July 25 and October 24.

A total of 1,429 forms were returned. After eliminating 45 inadequate or incomplete forms and 29 duplications, the forms completed by 1,355 families formed the basis for the report. The total population was 5,822 persons (an average of 4.3 per family), including 1,577 members (74 percent) of the student body. No information was available about the characteristics of the remaining 26 percent of the students and their families.

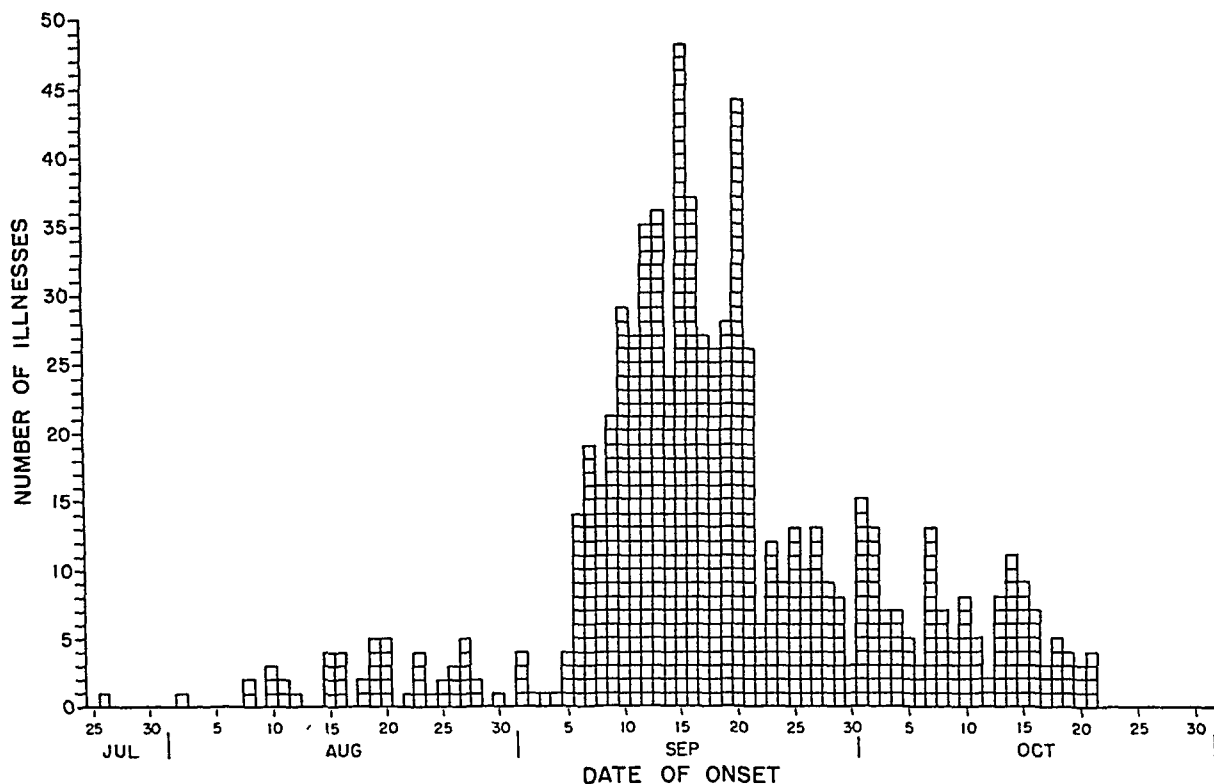
The mortality studies were limited to the reported influenza and pneumonia deaths of residents of Kansas City, Mo., from October 1, 1957, to March 31, 1958. A plan to obtain epidemiological data was organized during the first week of October when a sudden rise in the number of pneumonia deaths was noted. Each week a list of deaths attributed to influenza and pneumonia was obtained from the Kansas City (Mo.) Health Department. For each case epidemiological data were obtained about age, sex, and associations with influenza and with known chronic disease or other conditions, such as pregnancy and postoperative complications. Sources of this information were hospital records and interviews with physicians, relatives, or friends of the deceased. Whenever possible autopsy material consisting of samples of trachea or lung was obtained for virus isolations.

In this study a death was considered related to influenza when one of the following criteria was met: (a) symptoms of influenza were present, (b) influenza-like illness was present concurrently or within 1 week from date of onset of illness in one or more familial associates of the deceased patient, or (c) the Asian strain of influenza virus was recovered from post-mortem tissue specimens.

### Morbidity Among Students and Families

The general clinical picture of the illnesses of the students and their families consisted of fever of 100° to 101° F., chills, headache, sore throat, malaise, cough, and coryza. Of the

Figure 1. Incidence of influenza-like illness by date of onset in 745 students of Southwest High School, Kansas City, Mo., 1957



1,927 persons reporting having had an influenza-like illness, 84 percent had fever; 73 percent, headache; 77 percent, cough; 63 percent, sore throat; and 61 percent, coryza. A history of chest pain was given by 23 percent. A majority of the illnesses lasted 3–7 days.

The incidence of influenza-like illness (745 cases with date of onset given) reported among the high school students according to date of onset is depicted in figure 1. During August and the first few days of September, there were only sporadic cases. On September 6, the number of cases increased suddenly. The high attack rates were sustained for the next 2 weeks, and then abruptly declined. Although abnormal incidence continued for 3 additional weeks, the number of cases reported were of a much lower order of magnitude.

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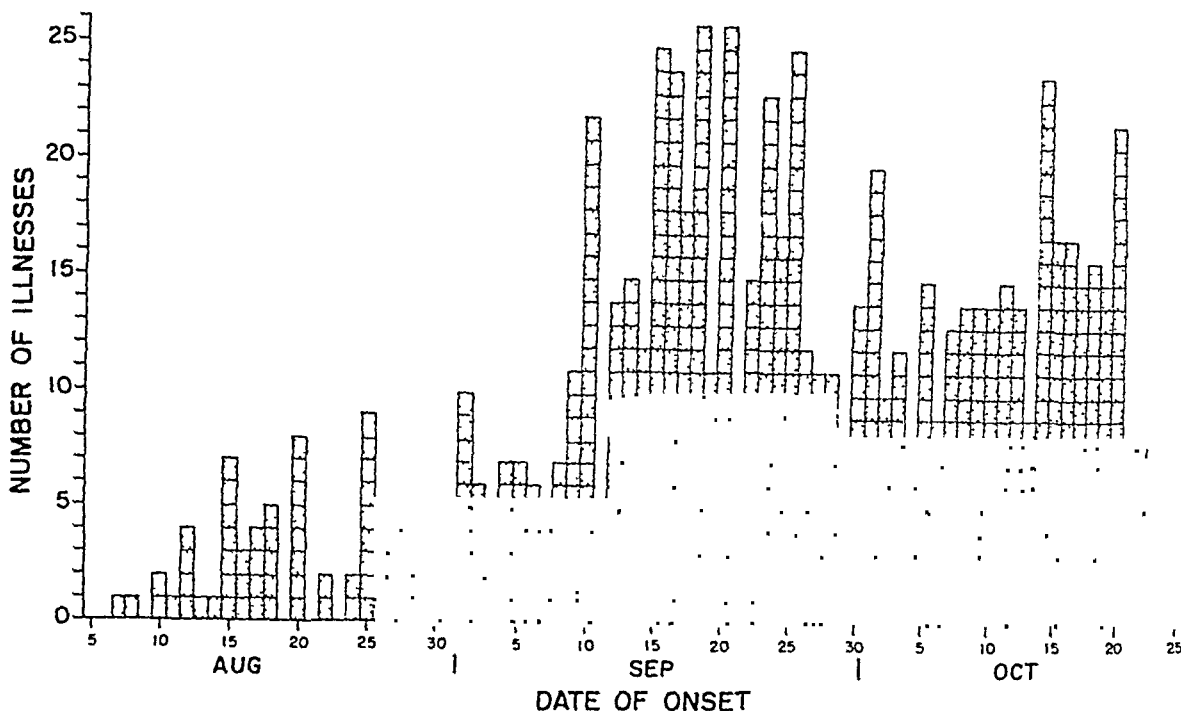
peak of the curve was broader. While the incidence in the high school had fallen precipitously by September 21, incidence continued to be high among the family contacts and was sustained until October 20, after which it abruptly declined.

Thirty-four percent of the 5,822 persons had influenza-like illnesses. The highest attack rate, slightly more than 50 percent, was observed in children aged 10–19 years (table 1 and fig. 3). Among children under 10 years of age, about one-third experienced clinical infection. About 27 percent of the young adults gave a history of having had an influenza-like illness, while in persons 40 years and older the incidence was 17 percent. There was no significant difference in the sex distribution.

The age-specific attack rates among the students attending Southwest High School were relatively uniform, ranging from 50 to 69 percent. The overall attack rate in this group was 59 percent.

The incidence of influenza-like illnesses

Figure 2. Incidence of influenza-like illness by date of onset in 776 family contacts of Southwest High School students, Kansas City, Mo., 1957



among the family contacts of the students of Southwest High School is summarized in table 2. The overall attack rate was 24 percent. The attack rates among children under 20 years of age were relatively uniform, ranging from 32 to 39 percent and decreasing with age. The rates among the teenage family contacts were considerably lower than those observed in the high school students.

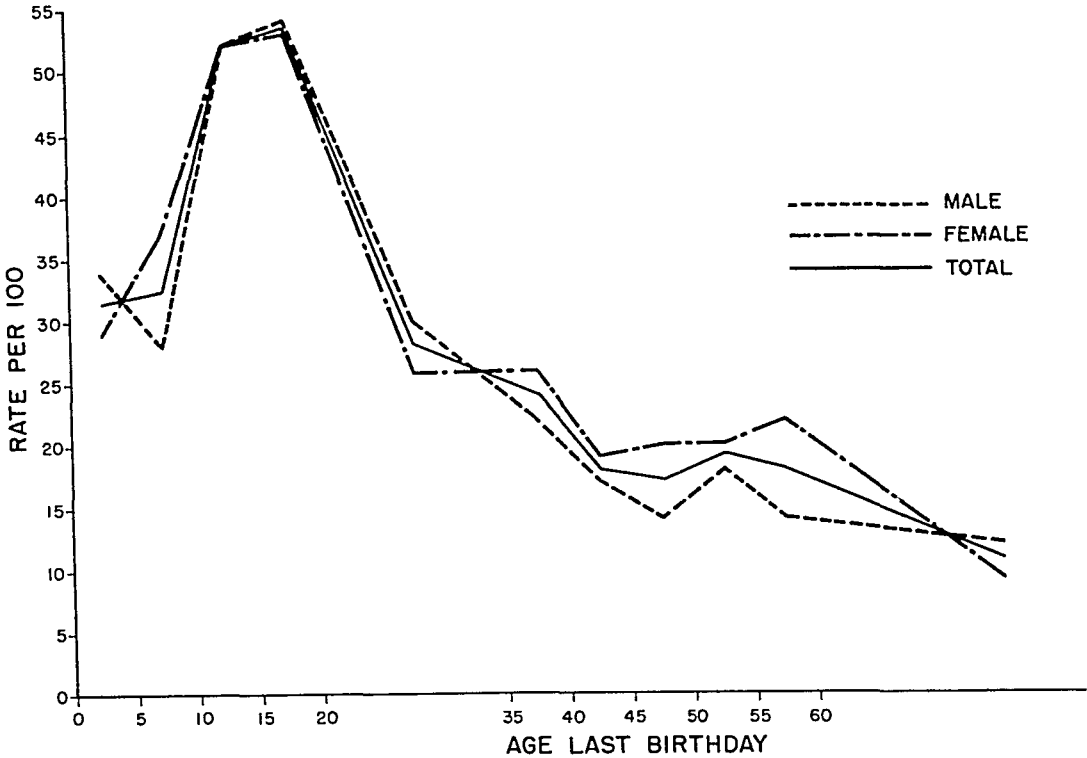
The attack rates with respect to family size are shown in table 3. Of 1,303 families included in this analysis, 85 percent were families with three to five members; the remaining 15 percent had six or more persons per family. The attack rate in three-member households was 30.7 percent; the incidence then gradually increased with family size to 40.5 percent in households having seven or more members per family.

The mean secondary attack rate was 14 percent. This observation was based on 2,596 persons exposed to index cases (first clinical case occurring in a family) in 712 families. The incidence of secondary cases with respect to age is shown in table 4. In calculating these rates, persons who became ill 1-10 days following ex-

posure to index cases were considered secondary cases. As expected, the rates among children were higher than those of adults, with the highest incidence in children aged 10-19 years. The secondary attack rate among children in the age group 10-19 years was slightly higher than that observed in children under 9 years of age; the difference, however, was probably not real, as it could have occurred by chance about 2 out of 10 times ( $P=0.23$ ). The rates among adults in the age groups 20 years and older were substantially lower.

When the distribution of 729 index cases (including 17 co-primary cases) by age was examined, 586 (80 percent) were found to be persons between 10 and 19 years of age. All but nine of these were students attending Southwest High School. As expected, less than 1 percent of the index cases were in children under 5 years. Frequency in age groups 20 years and over ranged from 2 to 4 percent. If index cases were presumed to carry the infection into the household, it appears that in this outbreak the high school students were the most frequent sources of household infections. Unfortu-

Figure 3. Incidence of influenza-like illness by age and sex among 1,355 families, Kansas City, Mo., July 25–October 24, 1957



nately, similar studies were not carried out in an elementary or a junior high school to determine similar relationship.

**Influenza and Pneumonia Mortality**

The total number of deaths from influenza and pneumonia reported among residents of

Kansas City, Mo., from October 1, 1957, to March 31, 1958, was 253, a mortality rate of 49.6 per 100,000 population for the 6-month period. This incidence is compared with that reported for the same period in each of 5 preceding years (table 5). The rate for the fall and winter, 1952–53, was 35.2, about one-third less than that

Table 1. Incidence of influenza-like illness by age and sex among 1,355 families, Southwest High School, Kansas City, Mo., July 25–October 24, 1957

Age group (years)	Total in survey			Attack rates per 100		
	Male	Female	Total	Male	Female	Total
0-4.....	76	75	151	34	29	32
5-9.....	203	221	424	28	37	33
10-14.....	601	619	1, 220	52	52	52
15-19.....	499	547	1, 016	54	53	54
20-34.....	87	132	219	30	26	27
35-39.....	130	302	432	22	26	25
40 and over.....	931	843	1, 774	16	19	17
Unknown.....	210	256	1 556	13	18	17
Total.....	2, 737	2, 995	1 5, 822	33	34	34

<sup>1</sup> Includes 90 persons concerning whom information on age and sex was incomplete.

**Table 2. Incidence of influenza-like illness among family contacts of students of Southwest High School, Kansas City, Mo., July 25–October 24, 1957**

Age group (years)	Number of contacts	Number ill	Attack rate per 100
0-4.....	151	48	32
5-9.....	424	138	33
10-14 <sup>1</sup> .....	509	198	39
15-19 <sup>1</sup> .....	181	69	38
20-34.....	219	60	27
35-39.....	432	106	25
40-44.....	737	134	18
45-49.....	535	90	17
50-54.....	280	52	19
55-59.....	101	17	17
60-90.....	119	12	10
Unknown.....	467	73	16
Total.....	4, 155	997	24

<sup>1</sup> High school students in these age groups were attending schools other than Southwest High School.

reported during the 1957–58 epidemic. In the winter of 1952–53 influenza A' infections were prevalent in the United States and were known to cause localized outbreaks in Missouri (2). During the 4 noninfluenza years, the mortality rates were one-half to one-third as high as those observed during the 1957–58 epidemic.

From October 1957 to March 1958, 7.4 per cent of the deaths were attributed to pneumonia and influenza. This figure is significantly higher than that reported for each of the 5 preceding years (table 6). The number of deaths from causes other than pneumonia and influenza was also higher during the 1957–58

**Table 3. Incidence of influenza-like illness by size of family, Southwest High School, Kansas City, Mo., July 25–October 24, 1957**

Size of family <sup>1</sup>	Number of families	Number of persons	Number ill	Attack rate per 100
3.....	278	834	256	30.7
4.....	539	2, 156	693	32.1
5.....	293	1, 465	490	33.4
6.....	123	738	257	34.8
7, 8, 9, 10.....	70	531	215	40.5
Total.....	1, 303	5, 724	1, 911	33.4

<sup>1</sup> 52 families with 1 and 2 members were not included.

epidemic as compared with that of the 4 non-influenza years.

The number of influenza and pneumonia deaths reported weekly for 1957–58 was compared with the adjusted average for the period 1952–57 (fig. 4). Two distinct waves of excess mortality were observed during the 1957–58 epidemic, one occurring in October and November and the other in the latter part of February. The 1952–57 curve does not show similar rises although the number of deaths increased slightly late in December and in the month of January; the slight increase undoubtedly represents a normal seasonal variation in deaths from acute respiratory disease.

**Table 4. Age-specific secondary attack rates of influenza-like illness among family contacts of index cases in 712 families, Southwest High School, Kansas City, Mo., July 25–October 24, 1957**

Age last birthday (years)	Total at risk	Number of secondary cases (1-10 days)	Attack rate per 100
0-4.....	83	19	22.9
5-9.....	232	41	17.7
10-14.....	411	89	21.7
15-19.....	309	71	23.0
20-34.....	109	14	12.8
35-39.....	252	37	14.7
40 and over.....	981	82	8.4
Unknown.....	219	15	6.8
Total.....	2, 596	368	14.2

The age-specific mortality rates based on 253 influenza and pneumonia deaths are shown in table 7. The highest rates were observed in the very young and the very old. The rate among children under 1 year was 529 per 100,000 population. In persons 65 years and older the range was from 185 to 521 per 100,000, with the rates rising as age increased. The age-specific death rates for 1957–58 were generally higher than those for the same period in the preceding 5 years. These differences were particularly noticeable in persons under 1 year of age and in the older age groups.

Although the age-specific death rates of the 1957–58 epidemic were higher in certain age groups, the age pattern of influenza and pneu-

**Table 5. Pneumonia and influenza deaths reported in Kansas City, Mo., October through March, 1952-58**

Year	Number of deaths	Death rate per 100,000 <sup>1</sup>
1952-53.....	165	35.2
1953-54.....	82	17.3
1954-55.....	122	25.4
1955-56.....	87	17.8
1956-57.....	87	17.6
1957-58.....	253	49.6

<sup>1</sup> Based on population estimates, City Health Department, Kansas City, Mo.

monia deaths was essentially unaltered. The age distribution observed in the 1957 epidemic was almost identical to that of the preceding 5 years (fig. 5).

The number of male deaths was significantly higher than female, 147 compared with 106. The probability of this difference occurring by chance is 1 in 100 when the proportion of males to females in the population is assumed to be equal.

Of the 253 influenza and pneumonia deaths, an adequate clinical history was obtained concerning 237. According to the criteria previously defined, 100 of the 237 deaths (42 percent) were associated with influenza; 80 patients had a history of influenza or an influenza-like illness, and 20 did not have symptoms of influenza but influenza-like illnesses were reported among the familial associates. Of the remaining 137 persons, history of influenza was not elicited as a part of the clinical picture nor was influenza observed among their familial associates.

**Table 6. Percentage of deaths attributed to pneumonia and influenza, Kansas City, Mo., October through March, 1952-58**

Year	Number of deaths from all causes	Number of pneumonia and influenza deaths	Percent of total
1952-53.....	3,329	165	5.0
1953-54.....	2,921	82	2.8
1954-55.....	2,919	122	4.2
1955-56.....	2,450	87	3.6
1956-57.....	3,016	87	2.9
1957-58.....	3,439	253	7.4

**Table 7. Influenza and pneumonia death rates by age, Kansas City, Mo., October through March, 1952-57 and 1957-58**

Age group (years)	Average, 1952-57		1957-58	
	Number	Rate per 100,000	Number	Rate per 100,000
0-1.....	13	153	45	529
1-4.....	3.6	11	4	12
5-9.....	.4	1	3	10
10-14.....	.8	3	1	4
15-19.....	.2	1	3	12
20-24.....	.4	1	3	8
25-29.....	0	0	1	2
30-34.....	.6	2	0	0
35-39.....	1.2	3	4	11
40-44.....	.8	2	10	29
45-49.....	3.8	12	8	25
50-54.....	3.8	13	12	40
55-59.....	2.4	9	15	59
60-64.....	5.4	25	15	71
65-69.....	6.8	39	32	185
70-74.....	8	71	26	231
75 and over.....	24	176	71	521
Total.....	75.2	16	253	56

In 185 deaths (73 percent) there was a history of pre-existing chronic disease or other associated conditions. Fifty percent of the 185 persons had cardiovascular disease, and about 18 percent chronic pulmonary disease. The conditions associated with the 185 deaths are tabulated.

Associated conditions	Number of deaths
Cardiovascular disease.....	92
Chronic pulmonary disease.....	33
Nervous and mental disease.....	15
Diabetes.....	10
Chronic alcoholism.....	9
Renal disease.....	6
Cancer.....	5
Rheumatism and allied disease.....	4
Liver disease.....	3
Lower urinary tract infection.....	3
Postoperative complication.....	3
Paget's disease.....	1
Pregnancy.....	1
Total.....	185

## Discussion

Three main criticisms are immediately evident in this study: (a) the questionnaire method of data collection is not as accurate nor as uniform as data obtained by an experienced medi-

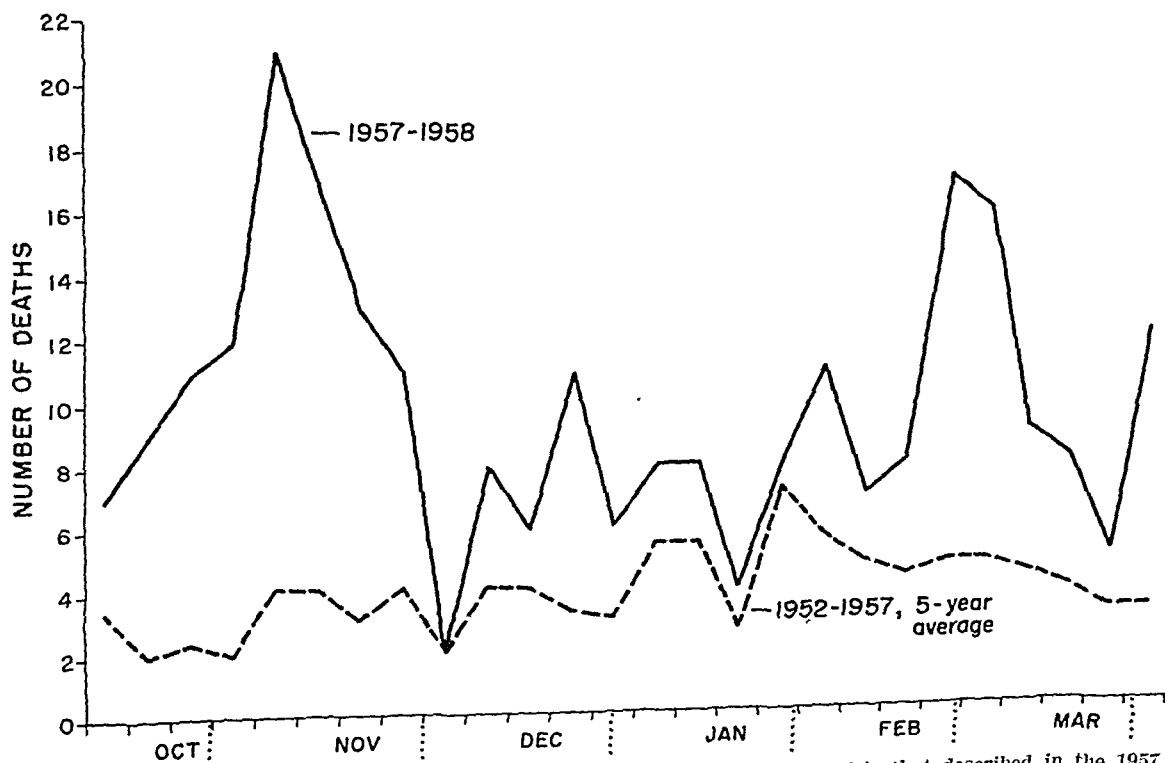
cal interviewer, (b) the population selected was limited to families with children of high school age, and (c) virologic studies were performed on a relatively small sample of cases. Despite these weaknesses, the clinical and epidemiological data derived clearly indicate that the epidemic was influenza and a majority of the illnesses observed during September and October were probably caused by the Asian strain of influenza virus.

The case incidence was high, reflecting the infectiousness of the agent invading a highly susceptible population. The overall morbidity rate of the survey population was 34 percent. The rate among the students attending Southwest High School was considerably higher, however, than that of the teenage household contacts not attending the same school. This observation indicates that the outbreak was cen-

tered in the high school and the infection spread to family contacts. This manner of spread undoubtedly explains the high frequency of index cases observed among the Southwest High School students.

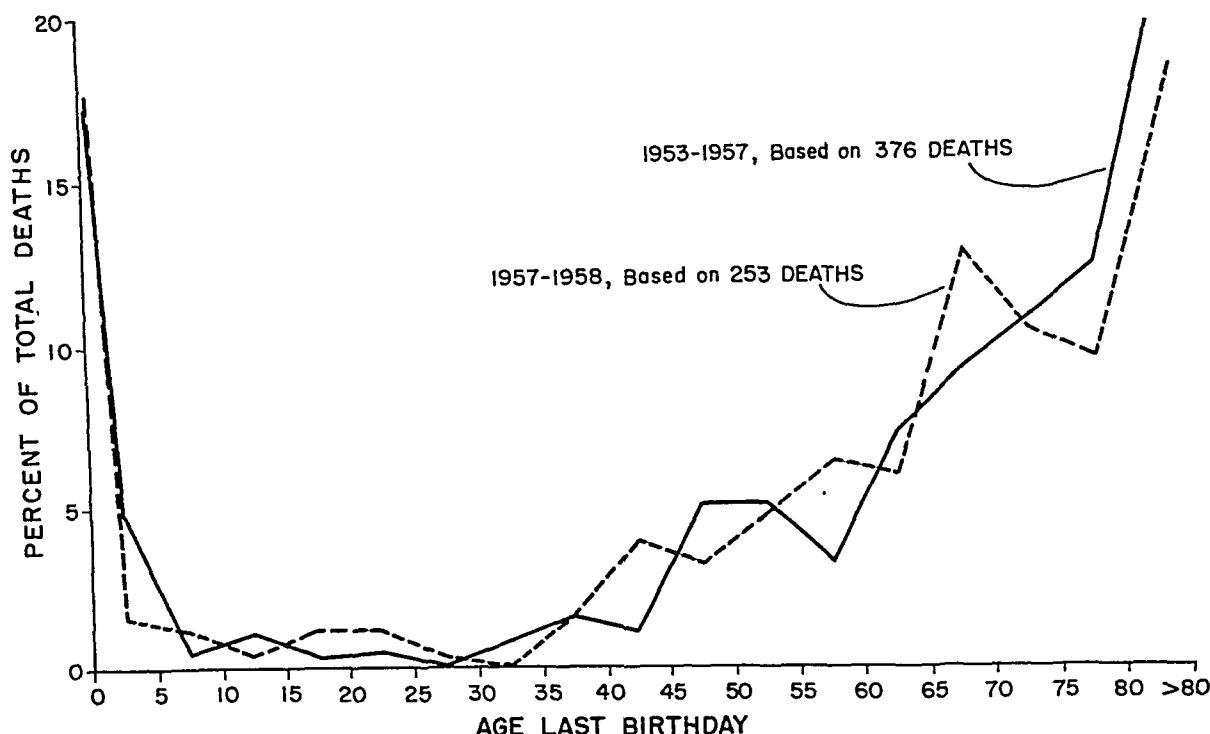
The variations in age-specific incidence are worthy of note. Although the Asian strain showed a marked difference in its antigenic property from all previously known strains of influenza virus and only a small fraction of the older population was shown to possess strain-specific antibody (34), not all persons were equally susceptible to the disease. The age distribution curve indicates that susceptibility to Asian influenza was greatest among teenagers, with progressive reduction as age increased. This type of age pattern was also reported in studies of Asian influenza in Louisiana (5) and in Melbourne, Australia (6).

Figure 4. Deaths associated with influenza and pneumonia by week,<sup>1</sup> Kansas City, Mo., October-March, 1957-58 and 1952-57



<sup>1</sup>The method of adjustment used to obtain the weekly average for 1952-57 is that described in the 1957 Morbidity and Mortality Weekly Reports published by the National Office of Vital Statistics, Public Health Service.

Figure 5. Percent distribution by age of influenza and pneumonia deaths, Kansas City, Mo., October–March, 1957–58 and 1953–57



The high attack rate observed among teenagers can be partially explained by the increased risk of exposure, since the epidemic was centered in the high school where more than half of the student body had experienced clinical influenza. The progressive decline in the incidence with increasing age probably is a reflection of partial immunity which was presumably acquired as a result of repeated infections with the influenza virus in the past. Evidence in support of this explanation has been suggested by the work of Francis and associates (7, 8) who demonstrated a high degree of correlation between progressive increase in resistance to influenza and acquisition with age of broader antibody spectrum because of repeated experiences with many antigenic variants of influenza virus. The recent study of Hilleman and associates (4) also lends support to this thesis.

Although the attack rate was higher in children aged 10–19 years than in those aged 0–9 years, such age selection was not evident among the family contacts. However, these results

are to be expected when children are exposed in a household environment where the degree of exposure becomes more equal. This observation seems to further support the premise that the increased attack rate which occurred among the teenagers was due to the greater risk of exposure in the school.

Two distinct peaks were clearly evident in the mortality curve, one occurring in the fall of 1957 and the other in February 1958. This pattern is similar to that observed elsewhere in the United States (9). The first wave of excess mortality was coincident with the sharp outbreak of influenza which occurred during the fall. The second, lesser wave of mortality also occurred during a period of increased prevalence of influenza. Infections in the second period were widely scattered and were limited to single families or small groups of persons such as those in hospital wards or in nursing homes. No survey was made to ascertain the extent of influenza occurring in the community at that time. However, examination of the admission records for respiratory disease at the



student health service of the University of Kansas Medical Center clearly indicates that a lesser, second wave of acute respiratory infections occurred in the month of February and the first part of March. Seventeen (90 percent) of 19 patients studied during this secondary wave were etiologically proved to have had Asian influenza (T. D. Y. Chin and R. A. Jordan, unpublished data).

While the number of pneumonia deaths observed in the current epidemic was significantly higher than that reported for the nonepidemic periods, the age pattern of the deaths was essentially unaltered. The skewed U-shaped curve was similar to that seen in Asian influenza outbreaks occurring elsewhere (10,11). There was no indication, however, that it had any resemblance to the pattern of the 1918 experience, when nearly 50 percent of the deaths from influenza and pneumonia were of persons aged 20-40 years (12).

### Summary

Asian influenza appeared in epidemic prevalence in the greater Kansas City area during the fall of 1957, followed by a minor secondary wave during the winter of 1958. A survey of 5,822 persons during the fall epidemic revealed an attack rate of 34 percent. The highest attack rate was observed in persons aged 10-19 years, with a decline in rates with increasing age.

The rate of clinical infection was related to family size, varying from 30.7 percent in three-member households to 40.5 percent in households with seven or more members. The secondary attack rate was 14 percent.

A total of 253 deaths due to influenza and pneumonia was reported in Kansas City, Mo., from October 1, 1957, to March 31, 1958, a mortality rate of 49.6 per 100,000. This rate was two to three times higher than that of the 4 preceding noninfluenza years.

Two peaks were observed in the mortality curve, one occurring in October and November, and the secondary peak in the latter part of February. The highest death rates were observed in the very young and the very old.

Seventy-three percent of the persons who died had a history of pre-existing chronic disease or other associated conditions, the majority of which were listed as cardiovascular or chronic pulmonary disease.

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# Evaluation of Food Sanitation Programs

F. GLENN LYNCH, M.P.H.

**T**HE EVALUATION of programs in many public health endeavors has aroused increasing discussion and interest in recent years. The concepts applied to the evaluation of the restaurant sanitation program of a local health department could, with slight modification, be adapted to a number of other programs.

At least two methods of evaluation must be considered before the equation, input equals output, comes near to being balanced.

In restaurant sanitation programs a realistic objective must be developed and work directed toward that end. When this objective has reasonably been reached, it must be maintained as long as it has public health meaning. Going through the motions of inspecting restaurants year after year with no realistic objectives is not only wasteful but nonprofessional. When a public health program or procedure becomes traditional and has lost its public health significance, it is past time for a thorough reappraisal. New objectives and new methods of accomplishing these objectives must be set forth.

The first method of evaluation, which will be merely mentioned, is cost versus value received. Restaurant sanitation programs cost dollars. Health officers, sanitarians, and others interested in fiscal management must eventually place a value in dollars not only on restaurant sanitation programs but on many other public health services. Programs may be altered and adjusted so that maximum value and acceptable standards can be achieved with a minimum of expenditure.

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*Mr. Lynch is chief of environmental sanitation, Berkeley (Calif.) Department of Public Health. The article is based on a paper given at the meeting of the Western Branch of the American Public Health Association, in San Francisco, June 1959.*

The second method of evaluation is to devise a means of measuring programs or achievements. Not many years ago, restaurant sanitation programs were loosely organized with little if any system and no professional objective. In general, the policy was to inspect restaurants when there was time and then try to get the owners to comply with the law.

If restaurant sanitation is to be approached in a professional manner, the sanitarian must not visit a restaurant, tell the proprietor that this or that needs correction, and walk out, only to return at some undetermined future date and, parrotlike, go through the same motions again.

In all scientific approaches the coarser measurements are made first. Most sanitarians have measured restaurant sanitation activities; for example, number of inspections, rechecks, and visits. These measurements are crude and perhaps served a purpose in years past, but do they really tell anything? In a certain district there were 46 restaurant inspections during the month. The exact number of restaurant inspections made in a specific district is meaningless unless the only purpose is to justify the time devoted to them. The time spent and the number of restaurants visited must somehow be related to accomplishment if this number is to have any meaning. If a sanitarian were to list his accomplishments during 1 month, it would have more significance.

There are two methods for establishing a baseline for a program and making subsequent measurements of progress. The first is a professional evaluation by an outside source, using a standardized scoring system, and the second is a self-appraisal based on the same standardized method.

An appraisal by an outside agency may be opposed by a few who have something to hide,

but more probably would be opposed by those who feel insecure about their activities. Such verbal reactions to an outside appraisal as, "My sanitarians and I know just as much about restaurant sanitation as they do," and "We don't need anyone to tell us anything," reflect a defensive attitude of sanitarians and directors of sanitation. They feel their competence and integrity are being threatened.

Their nonverbal thinking might be expressed as: "I am really afraid they will find the situation is not very good." "Maybe they will comment to the health officer that I am not doing a good job." "Perhaps State funds will be held back because of a substandard program." "Information may be given to the newspapers."

Attorneys, engineers, and physicians often call on consultants for advice and assistance without loss of professional integrity. Sanitarians can also do so in order to utilize collective knowledge to do the best possible work for their community.

Many sanitarians find restaurant inspections nonproductive and derive no satisfaction, personal or otherwise, in routine repetitious activity with no measurable success. Until their basic insecurity about the value of a program is replaced by confidence and they receive some degree of satisfaction from their work, their efforts will not be truly productive. What can result from an outside evaluation is illustrated by the experience of the restaurant sanitation program of the Berkeley Department of Public Health.

### Evaluation Surveys

In 1954 the city health department requested that the California State Department of Public Health evaluate the sanitary standards maintained by the eating and drinking establishments of the community.

The State health department team that conducted the survey was particularly conscious of the subjective nature of this type of evaluation. Every effort was made to standardize their procedure and to make their approach to the evaluation process as objective and uniform as possible. In many practice scorings and duplicate scorings, the team increased its objectivity, and scorings by its members varied only

slightly. It is difficult to be objective in this type of an evaluation; however, a survey appears, and has been substantially proven to be, the most objective way to evaluate programs such as restaurant sanitation.

Berkeley has had a restaurant sanitation program since the early twenties. In the survey of 1954 Berkeley had a mean score of 72.8. Neither in 1954 nor in subsequent studies was Berkeley's score compared with that of other communities which received a similar evaluation.

Evaluations using the same yardstick were performed in 1955 and 1956. The 1955 mean score was 73.7, and 1956, 73.1.

Following the 1956 evaluation it was decided that a change in program policies was indicated. At that time sanitarians lacked enthusiasm for the program, considering it more of a chore than a challenge. Two questions to be decided were: first, were the sanitary standards being maintained in the community satisfactory, and second, was the health department to continue a program which lacked vitality and was time consuming.

The scores in 1954, 1955, and 1956 indicated that no strides forward were being made although such variables as number of restaurants, size of sanitation staff, and effort expended remained almost constant. Perhaps if nothing were done, the score would remain the same. Without any supervision at all, some restaurants will maintain high standards, some, low standards, and the majority will be mediocre.

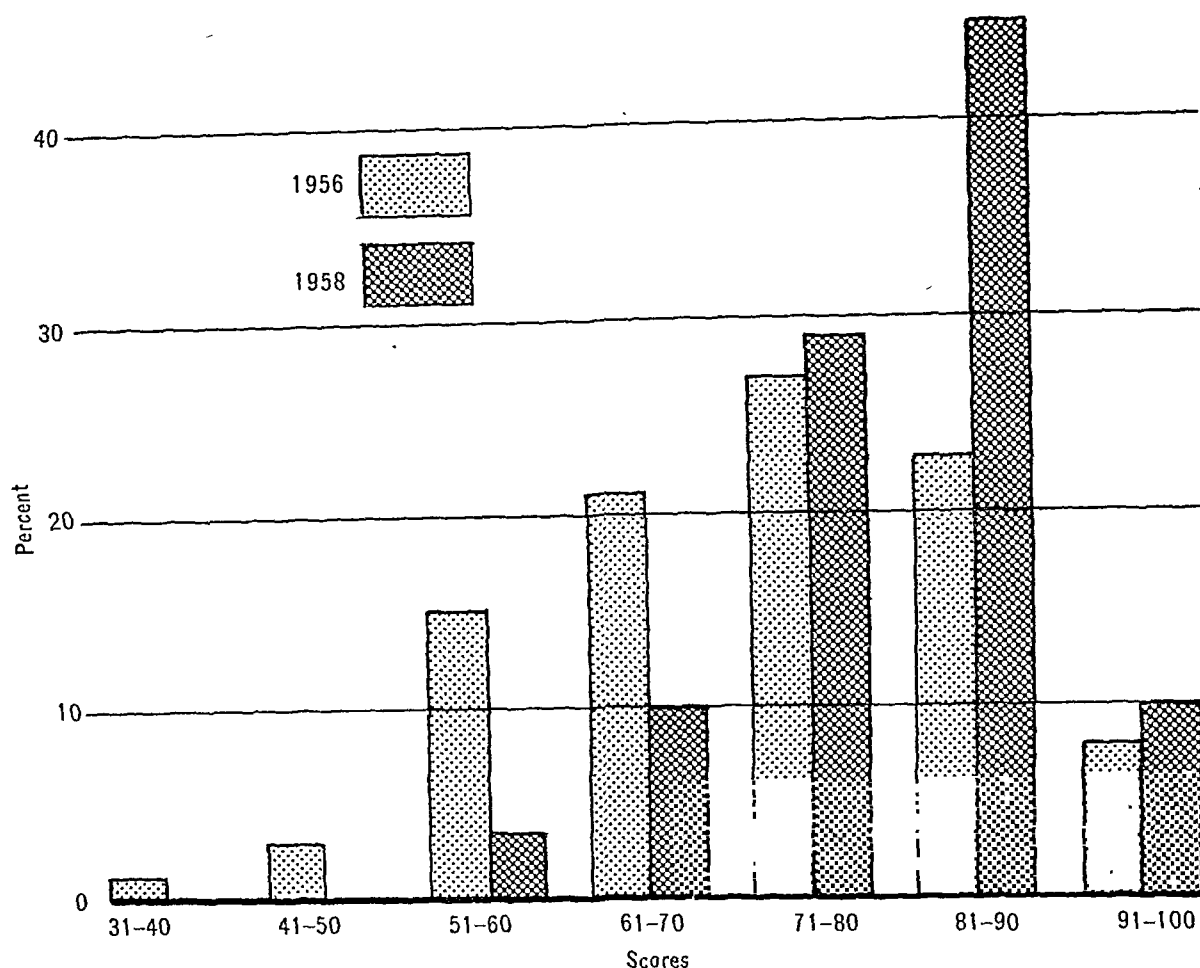
The question of why other programs, particularly housing, were approached with more enthusiasm and vitality than the restaurant program was answered. In housing, sanitarians had the ego-satisfying experience of success, of accomplishing something worthwhile. This was totally lacking in the food program.

### Changes in Policy and Procedures

A number of staff meetings were devoted to revitalizing restaurant sanitation activities in 1956. These meetings brought about many changes in policy and procedure.

The system of keeping records was changed. In the separate folder kept on each restaurant, a record of all contacts between the health department and the establishment is filed chrono-

Figure 1. Distribution of scores of eating and drinking establishments, Berkeley, Calif., 1956 and 1958 surveys



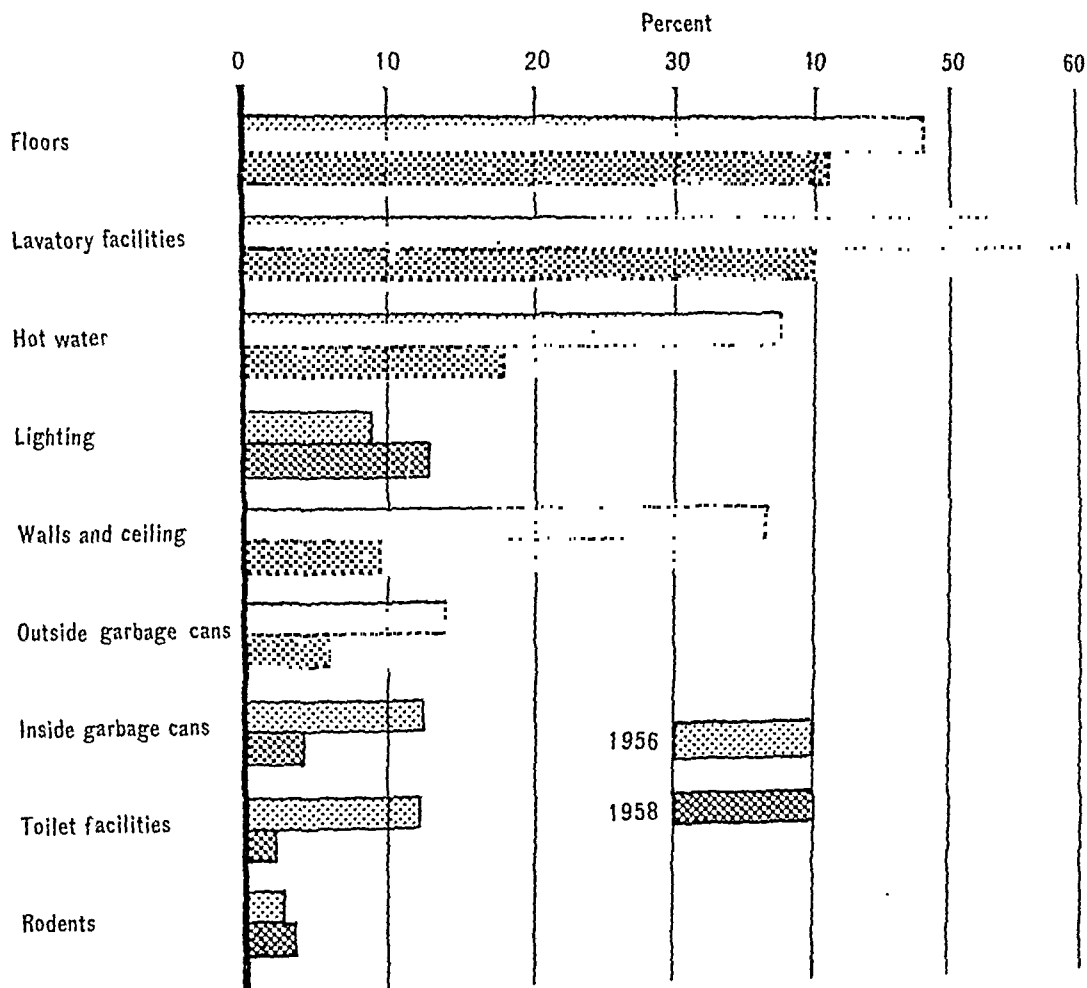
logically. The contents include not only the routine inspection forms but also entries of re-visits, rechecks, telephone conversations, letters, complaints, or other communications such as commitments, compromises, or mandates.

When an inspection is made it is thorough and complete. The old, and in some localities perhaps, still common practice of noting only a few items had created a great deal of confusion and inefficiency. This practice was based on the idea that if one were to stress all of the deficiencies at one time, restaurant owners might be overwhelmed, and nothing would be accomplished. This has proved to be a false and damaging concept. At present, the proprietor is approached on a strictly business-like basis, all the deficiencies are pointed out, and new deficiencies noted as they occur.

Previously, when a sanitarian inspected a restaurant for the first time and informed the owner of several violations, he was often told that his predecessor had been coming in for 2 years and never mentioned them. By presenting an incomplete report, a sanitarian is not only being unfair to the proprietor, but also to his department and colleagues. The proprietor concludes that everything which is in violation has been noted and all else is satisfactory.

In cases which must be prosecuted, the importance of complete, thorough, and accurate records cannot be overemphasized. The reluctance of the district attorney's office to prosecute is understandable if the record is vague, indefinite, and nonspecific. Such records serve absolutely no useful purpose.

**Figure 2. Comparison of selected physical defects in eating and drinking establishments, Berkeley, Calif., 1956 and 1958 surveys**



Also poor notes and records make it difficult for another sanitarian to take up the relationship established by his predecessor at precisely the point at which it had been dropped.

Many sanitarians, new to the department, to the district, or even new to public health, insist on starting a completely new relationship with the proprietor and completely ignore previous contacts. The only conclusion that can be drawn from such an approach is that the predecessor's judgment was not trusted. This is an extremely wasteful, time-consuming procedure.

Also, a successor can pursue an objective for a particular restaurant once it has been established after a complete inspection that has been accurately and fully recorded. Once

the objective is reached, the only responsibility remaining is to maintain it.

In Berkeley, the public relations value of this businesslike approach has been notable. Sanitarians have reported that compliance is prompt; there is little if any misunderstanding. They have expressed the feeling that as individuals they have gained a greater respect from the businessman.

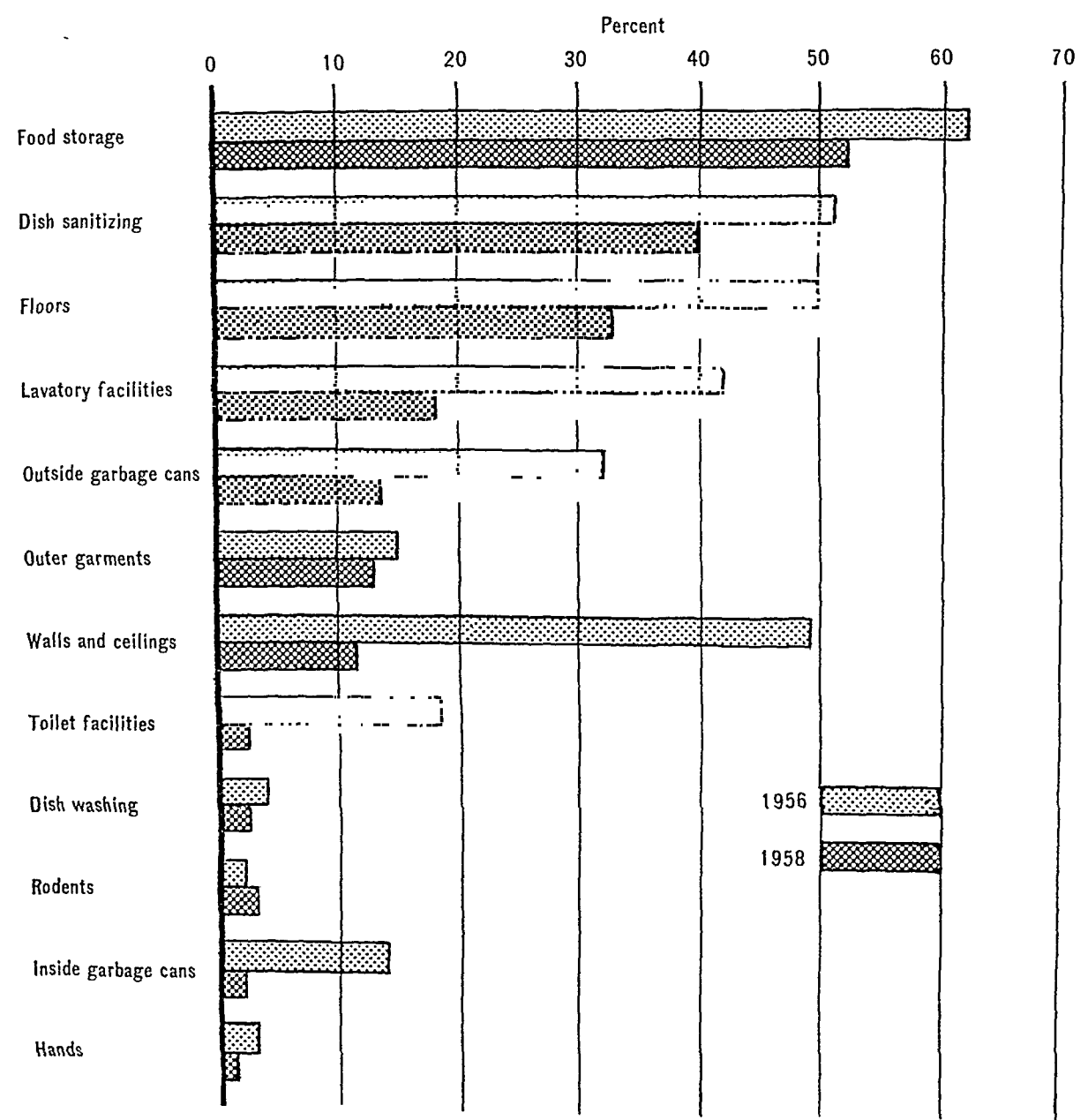
The followup procedure is extremely important. In the system established in Berkeley the recheck date is marked on a small card which accompanies the folder for each restaurant. The card is placed in a tickler file, and on the date specified it is pulled and the folder and the card given to the person who requested it. Each sanitarian keeps a calendar and sched-

ules rechecks according to other commitments. Each day's workload is scheduled and planned in advance.

The frequency of inspections is another item which has been drastically changed as a result of the 1956 evaluation survey. After the survey it was agreed that inspections be made every 2 months, or more frequently if necessary.

This step proved effective in getting the present program underway. It is felt now that the frequency of inspection can be left entirely to the discretion of the sanitarian. However, it was thought desirable that at least two inspections per year be made of those places receiving a minimum amount of service, the restaurants which consistently maintain high standards.

**Figure 3. Comparison of selected operational defects in eating and drinking establishments, Berkeley, Calif., 1956 and 1958 surveys**



These would be made to assure that previously noted high standards are continued, and also to keep sanitarians thoroughly familiar with the operation of each restaurant. The sanitarian is otherwise free to schedule inspections as he sees fit, permitting him to concentrate his efforts where they will be most productive, in the establishments with low scores in the survey. With these changes the program picked up momentum and interest was created. In December 1957, a little more than a year later, a request to the State was made for study of the restaurant program. As a part of this study, policy, local codes, frequency of inspections, supervision, records, and other items were discussed.

Those who conducted the study offered many interesting and pertinent comments which were brought to the attention of the staff. Those suggestions thought to be most important were incorporated into the program.

In September 1958, 2 years after the previous evaluation, the restaurant sanitation program was resurveyed, using the same yardstick and the same objective approach described earlier. Berkeley's mean score was 82.9, or an increase of almost 10 points (fig. 1).

Berkeley has established as an objective a mean score of 85. Once this goal is reached, it will become necessary only to maintain the status, which, theoretically, will require less effort than that required to raise it to this level.

Rough calculations indicate that this objective has now been reached, and any additional effort would result in diminishing returns. Berkeley has reached the practical maximum of achievement, and sanitarians can now devote the man-hours of time saved to other challenges of environmental health.

The survey was of particular value because it pointed out areas of emphasis rather dramatically. For example, the 1958 survey showed that 51.2 percent of the Berkeley restaurants

lost points because of poor food storage methods, an operational defect, and 41.9 percent lost points because of poor floors, a physical defect. On the other hand, it was found that rodents and insects were an operational problem in only 2.3 percent of the establishments, and only 1.2 percent lost points because of poor ventilation (figs. 2 and 3).

Although areas of emphasis would vary from department to department, these examples indicate what evaluation can mean in program planning. For sanitarians in Berkeley to spend a great deal of time on ventilation or rodent and insect problems would not be warranted. They must devote their efforts to instruction on good food storage methods and insistence on well-constructed floors.

### Summary

Evaluations are essential to efficient planning in food sanitation programs. At least two methods of evaluation should be considered: first, cost versus value received, and second, a means of measuring achievement as progress toward a predetermined objective. Both cost and performance are necessary ingredients in making a meaningful evaluation.

There are many personal and emotional factors which affect evaluation. If responsibility for restaurant sanitation is to be a meaningful public health activity, it must be approached in a professional manner. An objective, and the present position in relation to the objective, must be established.

An appraisal by an outside agency, technically competent to critically evaluate a program and to measure achievement, is one method of accomplishing a portion of an evaluation. Evaluation can improve service to the restaurant industry of a community and add enthusiasm and prestige to the local health department's program.

# The Radiological Health Program in Rensselaer County, N.Y.

LOUIS J. LANZILLO, B.S.

**A**VOID all unnecessary ionizing radiation. With this the objective, the Rensselaer County Health Department in New York State developed over the past 4 years a modest but effective radiological health program. Accomplishment of the objective is attempted by providing advice, guidance, and technical service in the use of ionizing radiation sources.

New York State became actively concerned with the health and safety aspects of ionizing radiation as a result of waste disposition problems of the early Atomic Energy Commission installations in the State. In 1952, the State health and labor departments took a census of shoe-fitting fluoroscopes. Under the then existing regulation 2 of chapter IX of the State Sanitary Code a program was initiated for controlling the specific hazards associated with the use of these machines. (As of July 1, 1958, the New York State Health Department outlawed the use of the shoe-fitting fluoroscope by unlicensed practitioners.) Both departments then appointed committees of experts to assist them in a study of the entire radiation problem in New York State. The State health department's Advisory Committee concluded that there was a significant and steadily in-

creasing radiation problem in the State and that the health department should prepare to meet this situation. This culminated in June 1954 with the preparation and acceptance by the commissioner of health of a program plan for radiological health. The objectives of this plan were education and training, regulation of radiation exposure, enforcement of laws and regulations, and research.

A radiological health section was subsequently established in the State department's bureau of environmental sanitation, and chapter XVI was added to the Sanitary Code, effective September 1, 1955, as the basis for a program of inspection, education, and correction. Chapter XVI is intended to control the "location or facility where radiation equipment is used or where radioactive material is produced, transported, stored, or used for any purpose." The regulations cover registration of radiation installations with the health officer having jurisdiction, definitions, construction, maintenance and operation, maximum permissible doses, personnel protection, medical examinations, patient protection, disposal of radioactive wastes, radiation instruments, handling of cadavers, monitoring of radiation installations, therapy rooms, warning signs, accounting for radioactive materials, radiation illnesses, injuries, emergencies, accidents, electrical hazards, vacated premises, and limitations on application of radiation to humans.

The interest of the Rensselaer County Health Department in radiation hazards was aroused

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*Mr. Lanzillo is a sanitarian with the division of environmental hygiene, Rensselaer County Health Department, N.Y. This paper is a revision of the one he presented at the 55th New York State Annual Health Conference in Lake Placid, N.Y., May 26, 1959.*



early in 1956. The department at that time had no personnel trained in this new field, but the staff was able to keep abreast of developments by the division of environmental hygiene's in-service training conferences and by consultation with the radiological health section of the State health department.

Using for a mailing list the county health department inventory, which was incorporated in the State census, letters went to the operators of every shoe-fitting fluoroscope in the county alerting them to the hazards. Also, a letter was sent to all operators of dental X-ray equipment urging them to see that their units had filters with the equivalent filtration effect of 2 mm. of aluminum. Filters were obtainable at a local dental supply house.

In the latter part of 1956, the county health department sanitarian was given training in the mechanics and theory of radiation management by inspecting medical, dental, and veterinary X-ray equipment in the county jointly with a member of the State radiological health staff. The reports on these inspections were reviewed with State radiation officials. Since the county health department had no equipment for monitoring radiations, it had to use the State's equipment when available.

Early in 1957 the county health department requested an appropriation to purchase monitoring equipment. Denial of the request delayed implementation of the radiological program.

During this temporary delay, the department concentrated on personnel training. Courses in basic radiation physics and radiological health survey methods were provided by the radiological health training staffs of the Public Health Service and the Atomic Energy Commission at the University of Rochester and elsewhere, in cooperation with the State health department. These courses were attended by the sanitarian, who was to become the supervisor of the radiological control program, and the director of the division. A course on sanitary engineering aspects of nuclear energy was held at the Robert A. Taft Sanitary Engineering Center, Cincinnati, Ohio, and was attended by the director of the division of environmental hygiene.

Later that year, through the efforts of the county health officer and the director of the

division of environmental hygiene, a special appropriation was granted to purchase the following basic monitoring equipment: an ionization chamber "cutie pie," a Geiger survey meter, six direct-reading pocket dosimeters of varying ranges, a dosimeter charging unit, a micrometer caliper, and a stopwatch. The cost of this equipment was approximately \$817.

### Program Elements

The responsibility for implementing the radiological health program was assigned to a sanitarian in the environmental hygiene division in addition to his other duties.

The first major undertaking was to determine where and in what quantities radiation was being used in the county. Registration of all sources of radiation with the local health department is required by chapter XVI of the State Sanitary Code. In Rensselaer County 52 operators voluntarily registered their installation following a press release by the State health department. It was suspected, however, that this number represented only a fraction of the sources of radiation.

To expedite registration, tearoff return postcards were sent to all other physicians, dentists, veterinarians, podiatrists, and osteopaths asking if they used X-ray equipment or radioactive materials. The list was assembled from the yellow pages of the telephone directory. A followup by telephone was made on those who did not reply, although the postcard reminder was relatively successful.

The survey revealed 111 installations of X-ray equipment as shown below. In addition, one hospital, one university, and one laboratory reported installations using radioactive materials.

Source	Number of X-ray installations	Number of machines
Medical -----	39	52 <sup>1</sup>
Dental -----	60	61
Veterinarian -----	5	5
Research -----	2	5
Other -----	5	5

<sup>1</sup> Includes 3 used for therapy.

Next, a letter was sent to operators whose installations were not registered asking them to register their equipment or materials immedi-

ately. To date, a total of 109 of the 111 operators have registered their radiation equipment. A few operators requested, and were given assistance in filling out the form.

Following the postcard survey and registration, a simple visible card file was set up on all radiation installations. Information on the card includes name of the installation, location, operator in charge, type of equipment, whether or not registered, and date of last inspection. The status of the installation is indicated by a colored tab to denote whether the installation was satisfactory or unsatisfactory.

Field investigations were the second major activity. Those undertaken at the beginning of the program were limited to shoe-fitting fluoroscopes, prohibited since July 1, 1958, dental units, and portable medical radiographic units. Field experience gained in company with the State personnel and the consultation service available from them and the division director helped build up the confidence of the supervisor. As confidence increased, activities were gradually broadened to include detailed investigations of X-ray departments in hospitals and laboratories.

An important adjunct of the field investigations is the education of the professional users of radiation sources to the significance of ionizing radiations, procedures for reducing radiation hazards, and application of improved techniques.

To assist users of dental X-ray equipment, the health department staff did some research in dental radiography, resulting in a suggested technique in which maximum protection from ionizing radiation will be provided, under the most practical conditions, for all persons concerned. X-ray procedures are patterned so that the operator is never in the direct path of "useful" beam for primary protection and his position utilizes distance and any available barrier for secondary scatter protection.

The procedure suggests: (a) the provision of a swivel armchair, similar to an executive-type chair, with an attached headrest, for use in X-raying the patient, (b) the location of the swivel chair near the X-ray unit, but, more important, against a wall in the room that faces an unoccupied area—the X-ray tube placed in line with the chair so that all X-ray exposures

are directed toward the chair which, to repeat, is located against the wall facing an unoccupied area, and (c) placement of the patient in the chair in any position desired because of the mobility of the chair. In a full-mouth series the operator can merely adjust the patient to the restricted direction of the X-ray tube and take the necessary exposures. This technique of positioning will prevent the operator from ever being in the direct path of primary beam. The operator must then assume a position as far as possible from the tube and patient and utilize any barrier in the room such as a wall or door for maximum protection from stray radiation.

Currently, the program is being expanded to include the safe management of radionuclides. The program supervisor attended a training course on hazards of radionuclides at the University of Rochester in 1958. He has also observed a representative of the Atomic Energy Commission on inspections of installations in Rensselaer County authorized to use radionuclides. This training has developed the program supervisor's familiarity with the uses of radionuclides in hospitals and laboratory research and the hazards associated with these materials. The use of radium in medical offices has not presented a problem in Rensselaer County because the survey revealed no authorized users.

Inservice training of the health department personnel in radiological health work continued as the program progressed. A particularly valuable course arranged by the New York State Health Department training section was given in a radiation workshop at the University of Rochester in November 1958. The session offered an opportunity for exchange of ideas and discussion of local experiences by those directly engaged in fieldwork in radiation control. Other such workshops are expected to be sponsored in various areas by the State health department.

### Program Implementation

In the field investigations, about every type of X-ray machine that might be used in medical, dental, or veterinary practice has been encountered. Poor technique, insufficient filtration, or lack of cones were commonly found

in the installations. Some of the hazards associated with these units and the protective measures suggested follow.

### *Radiographic Units*

A few old radiographic units with glass unshielded tubes are still in use by physicians and dentists. The department has been successful in discouraging the use of two such units. One dentist is buying a new 90-kv. unit, and another is having his X-ray work done by someone else.

One of the most common defects was the lack of adequate filters for the primary beam. The State Sanitary Code requires a total filtration equivalent to at least 2 mm. of aluminum. The filter absorbs the soft, less penetrating radiations, thereby protecting the patient from these dangerous rays. It eliminates scatter haze on film, and appreciably reduces stray radiation. This amount of filtration will not require an increase in the exposure factors to achieve a satisfactory film.

There was a conspicuous absence also of diaphragms or cones for collimating the useful beam. In some installations the collimating device was oversized. A diaphragm or cone of correct size in the useful beam serves to limit the size of the radiated area to that which is clinically necessary. For dental X-rays, the collimation should be adjusted so the patient is exposed to a beam no greater than 3 inches in diameter in order to protect the patient's eyes.

In conventional chest X-rays, operators were encouraged to protect patients from scatter radiation by draping an apron of one-half millimeter lead equivalent below the front of the cassette as an adjunct to close coning.

Frequently advice was provided for improving radiographic operational safety. In many instances the operator customarily stood either adjacent or close to the equipment, and sometimes directly in the path of the primary beam. For maximum protection from primary and stray radiation, operators are advised to stand as far as possible from the tube and the patient during an exposure. An extension cord on the timer button enables the operator to stand in an adjoining room or at least behind a shield. Operators were also informed that it is no longer necessary to use film requiring long ex-

posure. They were advised that modern fast film permits shorter exposures, thus reducing the dose to the patient and the stray radiation to the operator. The shorter exposure time also saves wear and tear on the unit.

When a dentist is contemplating purchase of a new X-ray film unit, the 90-kilovoltage unit should be considered in place of units operating at 45-70 kv., because the exposure time is reduced from the usual 1.5 seconds to 0.5 second. An 18-inch focal distance from the skin with a long lead cone device (15 inches) and 3 mm. of aluminum for filtration purposes will cut down skin exposure and reduce gonadal dose considerably.

### *Fluoroscopic Units*

Diaphragm shutters and tubes of fluoroscopic units were often found off center from the viewing screen. Under these conditions, the useful beam extended beyond the fluoroscopic screen and struck the operator. Centering the beam, of course, was recommended. In addition, operators were told to limit the shutters so that when fully opened there was a visible black margin of at least one-fourth inch around the screen at the maximum working distance from the table. It was also suggested that the smallest possible aperture of fluoroscopic screen be employed during examinations since both the volume dose and the scatter increase more rapidly than the dimensions of the fluoroscopic field.

Fluoroscopic screens frequently were not completely interlocked with the X-ray tube. The screen could be adjusted in various positions so that not all of the primary beam is intercepted by the protective lead glass of the viewing screen. Installation of a pin or hinge between the screen and screen frame was advised to provide an interlock with the tube.

As with radiographic units, absence of adequate aluminum filters was also common.

Leaded aprons and gloves in unsafe condition were occasionally found. Protective clothing for the operator and assisting technician are required to be checked periodically by the person responsible for radiation safety. In horizontal fluoroscopy, to assure adequate protection from scatter, it was recommended that an apron of one-fourth millimeter lead equivalent

hang between the patient and the fluoroscopist. This is in addition to a protective apron worn by the operator.

The time required to adapt the eyes to darkness prior to a fluoroscopic examination is particularly irksome to the busy physician. Dark adaption is essential because it permits adequate examination of the patient with the least possible radiation exposure. A dark adaption period of 20 minutes with polaroid glasses was recommended. Improvement continues up to 20 minutes but a minimum of 10 minutes of dark adaption is necessary.

Few fluoroscopic units encountered in the field were provided with a built-in integrating timer, although units installed after September 1, 1955, in New York State are required to have such a device to interrupt the circuit after 4 minutes of exposure. Operators of units installed before that date can satisfy this requirement by purchasing an interval timer, for less than \$10, and manually setting the clock for the 4-minute exposure. This control alerts the physician and reduces the possibility of over-exposure of the patient.

Sometimes the dosage rate at the table top exceeded the maximum 10 roentgens per minute. This unsatisfactory condition can be corrected by lowering the milliamperage, by adding more filtration at the tube port, or by increasing the distance between the tube target and table panel.

Operators are also advised of the availability of intensifying screens which make it possible to reduce the dose to the patient as well as to the operator.

### **Blanket Registration**

On May 20, 1959, a blanket registration was granted to Rensselaer Polytechnic Institute, one of the leading educational institutions in the State. Blanket registration is the authority for self-policing in compliance with the State health and safety regulations. This is considered the most practical method of accomplishing the objectives of the State Sanitary Code in view of the institution's increasing use of radionuclides and radiation-generating equipment in research and teaching. Special radiation facilities include a subcritical assembly reactor, a Van de Graff proton accelerator, a

betatron accelerator, a Cockcroft-Walton accelerator, and several X-ray diffraction units.

As a result of health department recommendations over a period of 3 years, the institution organized a radiological safety committee and appointed a radiological safety officer. A draft of the institution's proposed administrative control and radiological protection procedures was submitted to the county and State health departments for review and comment. The final draft, incorporating suggested revisions, was officially approved by the institution April 24, 1959. The procedures are divided into three parts: administrative, general radiological protection, and specific radiological protection. A unique feature is that the last part can be changed at any time without amending the entire document.

The radiological safety officer of the university is empowered to make inspections and impose additional requirements and emergency measures he deems necessary to maintain high standards of radiological safety. The radiological safety committee is giving considerable attention at present to radioactive wastes. The current plan is to use a commercial waste disposition agency in lieu of a burial area located in the county. Radioactive wastes at the moment, however, are being stored in a shielded storage room at the institute and are periodically monitored by the radiological safety officer.

Approval by the health department is required for the disposition of radioactive wastes by ground burial. Routine monitoring is specified and maximum concentration limitations are established. In the event of fires, accidents, unauthorized entry, thefts or losses, each such instance is to be reported to the radiological safety officer who in turn advises the Rensselaer County health officer. If the radiological safety officer cannot be reached, the county health officer is to be advised. The county radiological health program is geared then to protect the citizens from any unfortunate consequences that might result from the mishandling of radionuclides or radioactive wastes.

### **Summary**

The New York State Department of Health initiated activities in 1952 to control radiation

hazards. The Rensselaer County Health Department is carrying out this program in Rensselaer County.

The program, under the supervision of a trained sanitarian and with the basic monitoring equipment, consists of registration of installations, a visible card file record system, and inspection of radiation equipment. Activity is presently limited to radionuclides and certain other radiation sources, such as accelerators. The staff, however, is continually increasing its working knowledge and competence to carry out better the legislated responsibilities.

Much of the program consists of education in the safety values of shielding, distance, restricted exposure time, coning, filtration, and protective clothing. Although protective

means are available, the county health department must work tirelessly to develop safe habits and promote safe facilities among radiation users. To be effective this educational program seeks to stimulate self-discipline.

Rensselaer County's radiological health program has been developed with currently available space and staff and with an expenditure of less than \$1,000 for equipment.

This program is another demonstration of the advantages held by a modern county health department employing only qualified professional personnel. Such a department can adjust its activities to provide optimum public health protection in our ever-changing environment.

## Kimble Award

The deadline for nominations for the Ninth Kimble Methodology Research Award is June 1, 1960. The award, \$1,000 and a silver plaque, is given annually in recognition of the application of scientific knowledge to the public health laboratory.

Candidates must live in the United States, its territories, or Canada. Their work should be either a fundamental contribution which serves as a baseline for development of diagnostic methods within the province of the public health laboratory or the adaptation of a fundamental contribution to make it useful in a diagnostic laboratory.

Authors, their associates, or others may make nominations. Studies with more than one author will be accepted. The nominations must be accompanied by six summaries and a bibliography, also six reprints if available. A statement justifying the recommendation of the work and a letter of transmittal are required. Documentary evidence and related material should not be signed by the nominator. None of the material submitted will be returned.

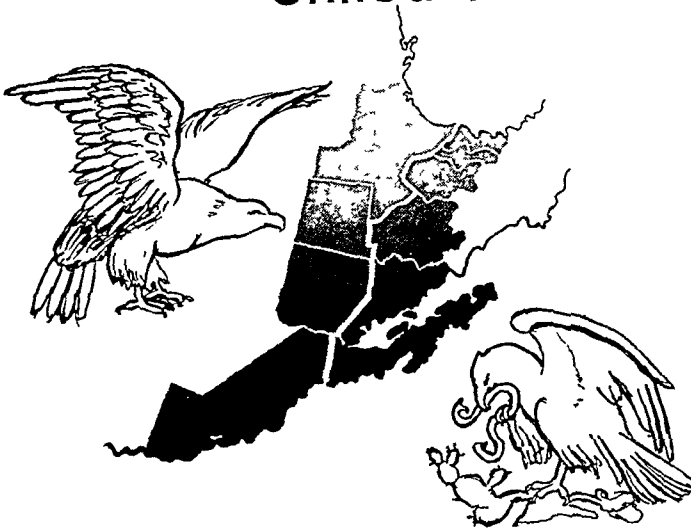
The Kimble award, established by the Kimble Glass Company of Toledo, Ohio, and sponsored by the Conference of State and Provincial Public Health Laboratory Directors, will be presented at the annual meeting of the conference in San Francisco, Calif., in October 1960.

Send all nominations to: P. R. Edwards, Chairman, Nominating Committee, Kimble Award, Communicable Disease Center, P.O. Box 185, Chamblee, Ga.

# United States-Mexico Border

## Public Health Association

### CONFERENCE REPORT



*A border 2,000 miles long, crossed 75 million times in the course of a year, gives rise to human relation problems with direct or indirect bearing on the health of communities and the individuals who live in them.*

ABRAHAM HORWITZ, M.D.

By interlinking public health planning along their common border, the United States and Mexico have been taking a realistic approach to the fact that disease recognizes no political boundary. The vehicle for their joint health efforts, the United States-Mexico Border Public Health Association, has for more than 17 years attacked issues of common concern through conference discussion and committee studies and has organized integrated action.

The 17th annual meeting of the association held in Brownsville, Tex., and Matamoros, Tamaulipas, Mexico, between March 30 and April 3, 1959, was attended by more than 300 public health workers. Speakers and delegates delineated the scope of public health responsibility, analyzed the interplay of public health and environmental elements, marked out areas for intensified effort, and reported achievements in control and research.

Presiding over the opening plenary session, Dr. Abraham Horwitz, director of the Pan American Sanitary Bureau, World Health Organization Regional Office for the Americas, emphasized that the economic matrix of a society nourishes or stunts the people's health and conversely the degree of progress of a community hinges largely on the abundance of human energy derived from sound health. In extensive parts of the Americas, he said, deficient nutrition and scarce water supply and other unfavorable conditions drain off the lives and energy needed to transform those conditions. Public health techniques must harmonize with all other activities which condition the individual's well-being. Among his other recommendations was the integration of all community public health activities within the local health agency, using the family as the basic unit. Public health workers should be aware, he

believes, of the trend toward pooling the hemisphere's spiritual and material wealth. As a short-run international health aim, he proposed an attack on diseases with strong economic ramifications; long-run goals should focus on creating and expanding local and national health services and training professional personnel.

Recognition of the frontier as "a two-way street" rather than as a barrier, observed Dr. John C. Cutler, Assistant Surgeon General for Program, Public Health Service, is contributing, through the exchange of venereal disease contact data, to control in areas far from the border as well. He urged each health agency and clinic providing services to braceros to function also as a venereal disease control station. After illustrating how venereal disease control activities have pioneered in casefinding and administrative techniques, he pinpointed one of the current challenges as the proportional increase in infectious syphilis among persons under 20 years old.

Another conference highlight was a roundup by Dr. David E. Price, Assistant Surgeon General and chief of the Bureau of State Services, Public Health Service, of health research in the United States during 1958, particularly in cancer chemotherapy, psychopharmacology, new drugs, and studies of viruses in the cause of cancer. Among current and anticipated challenges to public health planners he named staphylococcal strains resistant to antibiotics, shortages of medical personnel, and the negative health facets of urban environment.

For the past 4 years, he observed, there has been no material rise in life expectancy at birth. This expectancy can be increased mainly by maintaining the health and vigor of the growing number of persons of middle age and older.

Dr. Domingo Cervantes Gonzalez and co-workers summarized their activities in the Mexican National Antimalaria Campaign during 1958 in Tamaulipas, Mexico. An account of the construction and development of the Hermoso Valley, Mexico, water system was presented by Alfredo Sahagun Sahagun, the system's manager. During the session, the participants selected Hermosillo, Sonora, for their 1960 meeting.

Following are summaries of selected papers presented at the conference.

## Mexican School Hygiene Covers Broad Scope

A function of school hygiene in Mexico, in promoting students' physical, mental, and moral health, is to monitor the environment in and around the school for unwholesome elements, asserted Dr. Manuel Aveleyra Arroyo de Anda, director general of school hygiene, Ministry of Public Education, Mexico City. Hygiene units, he explained, watch the neighborhood for sale of unhygienic foods, inappropriate businesses, and unsafe traffic conditions.

Relating highlights of Mexico's 77-year experience with school hygiene, Aveleyra revealed that Aztec children were taught rigid hygiene practices and were lightly clothed for health and growth. Colonial Mexico had medical inspection of Royal University students and smallpox vaccination, leading to the disease's ultimate eradication. Correctional houses, he said, date from the postindependence era when juvenile delinquency was serious, and a school for deaf-mute children was founded by Emperor Maximilian. A pedagogic-hygienic congress in 1882 produced the scientific, organized application of school hygiene, followed not long after by the setting up of a special unit of medical and hygienic inspection for schools.

School hygiene, stated Aveleyra, aims to promote in students "assimilation of learning, adaptation to the prevailing medium, hygienic habits, and sanitary convictions." Since teachers are basic supports, students of normal schools are screened for the mentally and physically unfit and teaching candidates are periodically checked and provided health services. Throughout their careers, teachers' health is watched; they are given hygiene publications, courses, and lectures. Also, they take active part in routine hygiene work. In schools without hygiene services, they receive instructions for their own health care and pupils' hygiene. All kinds of workers on school premises come under the hygiene program.

Following set norms, pupils are given health education and guidance in psychic and biological development, including medical assistance and rehabilitation. They receive medical-prophylactic examinations and are classified and vaccinated. In 1958, stated Aveleyra, the hy-

giene department examined about 773,000 pupils, of which roughly 154,000 were found with a disease.

Among the activities he described was the 1953 antituberculosis campaign, in which school children sold almost 3 million stamps, thus raising funds to start an antituberculosis dispensary for the schools. In school festivities, such as School Hygiene Week, parents mingle with school personnel and pupils and are exposed to information on hygiene. Home visits are made by committees on school hygiene composed of students elected by classmates, trained by school medical personnel, and supervised by a selected teacher.

Aveleyra mentioned that the work of each school medical zone, comprising schools totaling 4,500 to 5,000 pupils, is planned with flexibility yearly in advance by the department of school hygiene and school authorities.

### **Encephalitis in Texas Had Economic Impact**

The three encephalitis viruses, first found concurrently in south Texas in 1941, have been an important public health challenge there during 3 of the last 5 years. This was mentioned in a brief review of findings on these viruses in Texas by Dr. J. V. Irons, Dr. Richard B. Eads, James E. Grimes, and Thelma D. Sullivan, division of laboratories, Texas State Department of Health. One reason, they said, lies in the relatively abundant water supply in the Lower Rio Grande and extended irrigation of the Texas High Plains area which favored propagation of mosquito vectors. Western and St. Louis encephalitides are most active in Texas; eastern, the least.

Small outbreaks occurred in 1944 and 1952. Then in 1954 an outbreak was followed by 500 cases later that year in Hidalgo County, mainly from western encephalitis. The St. Louis variety predominated in a large 1956 outbreak in the Texas High Plains and caused a lesser one in Cameron County in 1957.

In the Hidalgo and Cameron County outbreaks, illness ranged from numerous subclinical cases to an occasional fatality, affecting all age groups but mostly young-adult and middle-aged men. The economic impact was heavy.

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## **RESOLUTIONS**

Among the resolutions adopted during the 17th annual meeting of the association were those dealing with:

- more intensive efforts toward control of venereal disease in border cities, including serologic testing of migrant labor, greater use of municipal, State, and Federal resources, and extended training.

- recommendations that infectious syphilis cases be considered medical emergencies, calling for exhaustive epidemiological study and rapid control.

- intensification and expansion of training for border health personnel, including opportunities for observation of conditions and health practices in both countries.

- strengthening health information exchange on both sides of the border.

- for emergency treatment of diarrhea, adequate equipment, physical facilities, and expert personnel, in border health centers.

- possibilities of setting up a scientific committee of experts from both countries to make an epidemiological study of encephalitis along the border and to suggest control measures.

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They also pointed out the difficulty of differential diagnosis of encephalitis and aseptic meningitis.

### **Says Goat Product Output Should Be Industrialized**

In large areas of Mexico, the entire goat population may have brucellosis, reported Dr. Alfonso Elizondo of the Rural Cooperative Medical Service in the Mexican Ministry of Health, Mexico City. Rapidity of contagion keeps infection high, he explained, with consequent intensification of health and economic hazards to farmers. Of bovine origin, the disease is under gradual control through pasteurization and livestock vaccination.

Elizondo holds that the only practical way to control *Brucella melitensis* from goats is to remove the animals from farmers' living quarters some distance to communal corrals and to organize on a cooperative basis groups of farmers for animal care and small industrial plants for



making goat products. Not only will this reduce brucellosis from animal contact but that from atmospheric dust as well since goat refuse will be far from farm homes. Industrial handling of goat products will control the disease acquired via food. He pointed out that the plan required organizing communities, finances, product distribution, and utility allocation.

Another control technique he mentioned is goat vaccination with live vaccine, so far successful where adequate facilities for evaluating findings exist, as in Comarca Lagunera.

## **Rabies in Wildlife Blocks Eradication Elsewhere**

Though rabies in dogs has been steadily reduced in border areas, the disease in wildlife during the last 10 years has climbed. This has kept the rate of infection among the Nation's domestic animals almost stationary despite public health measures, stated Dr. Donald Miller, veterinarian in charge of the Animal Disease Eradication Division of the U.S. Department of Agriculture, Phoenix, Ariz.

The menace to the livestock industry and to public health calls for a triple-pronged attack: State and Federal control of the disease in urban pets; an attack by the Fish and Wildlife Service and similar agencies on wildlife rabies; and cooperation of the U.S. Department of Agriculture with these authorities, particularly in protecting livestock and poultry. He described Department of Agriculture activities as including epidemiological studies, aid in drawing up local regulations and in spreading control information, and vaccinating dogs on Indian reservations. He also mentioned inspecting, licensing, and testing rabies vaccines.

Among border States, Texas is hardest hit by rabies in domestic animals, said Miller, citing the 49 cases reported there in 1957 and the 74 in 1958. He gave these national figures for 1957: 654 cattle, 24 horses, 13 sheep, 16 swine, and 12 goats. In 1958, reports cover 839 cattle, 37 horses, 34 sheep, 24 swine, and 6 goats.

### *Rabies Control in Texas*

Dr. George A. Martin, veterinary public health division of the Texas State Department of Health, attributed an increase in rabies cases

in Texas in the first quarter of 1959 over the comparable 1958 period to a rise in the number of rodents and other small animals and therefore in the population of predatory animals, such as foxes, coyotes, wolves, and skunks.

In 1958, canine rabies cases totaled 236, said Martin, compared with 52 cases in the first quarter of 1959. For cats, he gave the figures of 21 and 20, respectively, and, after pointing out the difficulties in accurately gauging the extent of wildlife rabies, he estimated comparable totals of 106 and 52 for foxes; 45 and 35 for skunks; and 23 and 27 for cattle.

On the request of local authorities, Martin's unit helps set up rabies control concentrating on immunizing the dog population, controlling stray dogs, and abating the wildlife reservoir when indicated. In an analysis of several local successes and failures in control programs, he mentioned the pitfall of trying to finance control activities through high-priced dog license fees. Registration and immunization slacken as a result, he said. He recommended instead free dog registration as an initial control measure. Success in controlling rabies leans heavily on public education, he concluded.

## **Salmonella Still Thrives In Contemporary Setting**

Modern ways of preserving and transporting food are fraught with the danger of allowing contamination with *Salmonella* organisms and of promoting rapid dissemination, in the opinion of Dr. Carl D. Heather, Ruth Keaton, H. D. Brethower, and Joseph M. Murphy, Jr., of the Texas State Health Department in Austin.

They cited the rise in number of isolates found in Texas in the last 5 years and a parallel increase in serotypes, which they attributed in part to the import of raw materials from abroad and to returning tourists. The rise in *Salmonella* reading isolates reflects a nationwide trend, they said. Among the outbreaks they reported were one with *Salmonella oranienburg*, the most commonly isolated serotype, and others with the rare *Salmonella chester* and *Salmonella blockley*.

They cautioned against too rapid incrimination of infection sources of outbreaks because some types are so common, recommending

phage typing for tracking down these sources. With all our emphasis on hygiene and our sanitation weapons, *Salmonella* still thrives, they commented.

### *Dog Food as Infection Source*

Dog food as an important source of *Salmonella* infection in dogs is the subject of an on-going study reported by Dr. Heather and Barbara Nobles of the department's division of laboratories. They believe that canine infection may be an important cause of human salmonellosis.

Inspired by a 1955 study by Galton and associates, Heather and Nobles sampled 14 brands of dog food from retail stores. Three were positive, one consistently so, and each of the others yielded *Salmonella* from one box out of six tested. To date, Heather and Nobles have found 400 isolates representing 18 serotypes, 12 of which were found in human stools.

Samples from each box cultured in tetrathionate broth and streaked with *Salmonella-Shigella* and brilliant green agar at 24- and 48-hour intervals yielded 9 serotypes; another trial with 7 enrichments and daily streaking for 4 days gave 15 serotypes. No salmonellae were found in formed or pressed foods.

### *Salmonella dublin Outbreak*

Prefacing an account of a *Salmonella dublin* epidemic in southern California in the autumn of 1958, Dr. Robert D. Courter, assistant chief of the Veterinary Public Health Section, Communicable Disease Center, Public Health Service, stressed the economic and public health hazards posed by this organism.

Contrasted with its current importance elsewhere, the organism has low incidence in the United States thus far, and apparently appears only in the west.

In adult cattle, *S. dublin* may cause sporadic outbreaks and epidemics associated with other weakening conditions, especially in asymptomatic carrier animals. Infection in calves, severest among those up to about 3 months of age, is favored by overcrowding, poor nutrition and sanitation, and inadequate reaction to antigenic stimuli.

The California outbreak consisted of 11 laboratory-proved cases and 19 suspected, all

traced to a certified raw milk dairy. *S. dublin* was isolated from 3 of a herd of 400 cows. Courter remarked that only repeated bacteriological tests of feces are reliable in detecting infected and carrier animals. Recovery of the organism from milk, the usual medium for man-to-man infection, tends to be from fecal rather than mammary contamination.

Courter feels that the epidemic has underlined the need for close work between authorities concerned with animal health and those dealing with human health.

### **Says Diarrhea Hazard Is Underestimated**

Neither physicians nor the public ascribe enough importance to diarrhea among children, asserted Dr. Reynaldo A. Garza, pediatrician in the coordinated service of health and assistance of Nuevo Laredo, Tamaulipas, Mexico. In his city alone, the disease causes 50 percent of all children's deaths, he said, commenting that the causes of many cases of diarrhea remain uncertain, but that some degree of malnutrition was a factor in all these deaths.

Garza proposed, for cities like his with health centers, a unit for pediatric emergencies staffed with experts in required procedures. It should be open to all at all times.

Comparing statistically deaths among children under 5 years old in Nuevo Laredo with those in several world areas, he remarked that his city's figure of 40.2 percent of all deaths lies closer to Africa's 64.4 percent than to 8.9 for the United States. Of each 1,000 live births in Nuevo Laredo, 45.96 died from diarrhea and 6.09 from malnutrition. He also observed that the rate of 12.64 for deaths from lesions due to labor, dystocia, or premature labor should stimulate further obstetrical studies.

Garza reported a Mexican study of 12,000 coprologic specimens showing first in order of frequency the *Salmonella* species: *typhimurium*, *anatum*, and *derby*; and next the *Shigella* species: *flexner*, *sonnei*, and *boydii*. In a 1958 study in Nuevo Laredo, 32 specimens had non-pathogenic *Escherichia coli* in 11 samples and *Paracolonobacterium* in 4. He announced that findings of the National Pediatrics Association of Mexico in a nationwide investigation of the

etiology of infectious diarrhea has been scheduled for publication.

## Level of Hog Use Is Key To Leptospirosis Rate

The rate of human infection with leptospirosis of porcine origin hinges on the total number of hogs intensively exploited rather than on the total hog population, stated Dr. Manuel V. Ramirez of the Institute of Animal Investigations, Palo Alto, Mexico. He recommended stringent measures for eliminating the disease in Mexico, emphasizing that control should start with the hog.

Pigpens should be well drained, sunlit, and well ventilated, with cement floors, abundant running water, and antirodent equipment. Measures should include periodic disinfection, isolation of newly arrived hogs until shown free of the disease, periodic testing, immunization, and treatment of carriers with antibiotics.

Discussing serotypes pathogenic to man, Ramirez observed that rodents are primary reservoirs for most, and that transmission to hogs is through contaminated food, water, or soil. Among the characteristics of leptospirae are survival for more than 10 days in water with little chlorine and longer periods in alkaline soils, death in less than 10 minutes from radioactive ultraviolet rays, less than 10 seconds in 70° C. of dry heat.

Leptospira in the hog's blood, said Ramirez, favors infection of slaughterhouse workers; in an Australian study, 76 percent of such workers showed antibodies to two serotypes. In hog-producing Iowa, a study showed 16.4 percent of veterinarians had antibodies, and in Missouri, 5.2 percent.

## Urges Tightened Laws For TB Control

The weak link in tuberculosis control along the border has been in applying legal restraint on recalcitrant patients, according to Jack C. Postlewaite, director of the tuberculosis division, El Paso City-County Health Department, Tex. He commended local physicians, however, for almost unanimous cooperation in reporting tuberculosis cases during 1958.

Postlewaite observed that El Paso is exposed to the disease from both human carriers—the so-called cured and arrested cases from nearby sanatoriums—and bovine, from Mexico, where it is endemic.

Postlewaite stated that deaths from tuberculosis have declined more rapidly than the case rate in recent years. This is explained both by improvements in treatment and in casefinding and reporting. Approximately 300 patients were in the tuberculosis hospital in 1952 compared with about 700 in 1958. This rise he attributed to intensive study of a large population of potential patients. When, for example, a meningitis prophylaxis study was conducted with Federal funds among 189 patients, a concurrent rise of about 300 percent was reported in the disease's incidence among school children under age 15. Other special studies were on 397 tuberculosis contacts, with Public Health Service aid, patch tests on 10,421 children, and another using X-ray mobile units which reached 6,505 persons in the county in 1958.

Postlewaite pointed out that in 1948 hospital tuberculosis cases were evenly distributed among minimal, moderately advanced, and far advanced. Since 1952 moderately and far-advanced cases have decreased, and minimal have increased 300 percent since 1955.

For developing tuberculosis control and therapy, Postlewaite's recommendations included:

- Local ordinances requiring X-ray surveys of food handlers; enforced isolation of positive pulmonary cases; appropriate legal action to hospitalize and treat recalcitrant active cases.
- Frequent public health nurse visits to homes of suspected persons; good contact studies by X-ray, skin tests, and gastric or sputum culture studies and active tuberculin skin tests of school children under age 15, and X-ray screening of older persons.
- Prohibiting tuberculosis suspects or persons with so-called arrested or cured disease from exertion until three sputum and three gastric cultures are reported negative.
- Skin tests (Mantoux) of all patients attending the well-baby clinic, at yearly or preferably 6-month intervals.
- Required regular examination, by the physician and tuberculosis control nurse, of a case

registry for control and treatment of all cases observed during the year.

- A pulmonary tuberculosis unit for isolation and therapy in a general hospital operated by the city and county, which may be used for temporary isolation and detention before transfer to the State hospital.

- A preventorium for isolation of contact children and a chronic disease hospital for patients with negative sputums but with crippling pulmonary or cardiac conditions secondary to the disease.

Screening for tuberculosis at the well-baby clinic in El Paso was described by Elizabeth Marcus, tuberculosis coordinating nurse in the El Paso City-County Health Department.

In addition, said Marcus, family members of patients are asked to the clinic for X-rays or skin tests. From the well-baby clinic following this screening routine, she announced, nine children were put under preventive treatment in 1958.

### **Sees Isoniazid Prophylaxis Only for High Risk Cases**

Because of today's limited risk of tuberculous infection, the practicality of using isoniazid as a prophylactic among tuberculin negatives generally was questioned by Dr. Francis J. Murray, special consultant in the tuberculosis program of the Public Health Service. Its use could be foreseen where exposure is great and unavoidable, however. He mentioned large-scale studies of naval recruits indicating less than 6 percent tuberculin positives, a drop in infection prevalence to about two-thirds of the rate among them in 1950.

Murray's comments followed his review of a series of controlled studies conducted by the Public Health Service.

A longitudinal study of the chemoprophylaxis potential of isoniazid on 2,750 children with asymptomatic primary tuberculosis operated in 33 pediatric clinics in the United States, Mexico City, San Juan, P.R., and Toronto, Ontario, beginning in 1955. Administrators carefully assigned children to groups receiving isoniazid or comparable groups taking placebo, in a "double-blind" manner: neither subject nor investigator knew which were the controls.

Daily doses of isoniazid were from 4 to 6 mg. per kilogram of body weight. About 60 percent of each group were less than 4 years old, 10 percent less than a year, and the rest ranged up to 16.

Results of clinical, laboratory, and X-ray examinations made monthly the first year and quarterly the second were evaluated by a board of six investigators selected by all such participating workers. The first year, 2 definite complications showed in the isoniazid group compared with 27 among the controls. In the second year, among the 750 taking isoniazid and 740 taking placebo, the figures were 3 and 6.

A subsequent study begun in 1957 has covered about 28,000 household contacts in cooperation with 37 health departments in the United States and in Juarez, in 16 centers in Puerto Rico, and 27 villages in Alaska. About 3,500 of these contacts are in border States.

Members of households with new cases are X-rayed and tuberculin tested. The contact population is divided at random into matched groups by household size, one to receive isoniazid and the other, placebo. The study is also double blind to eliminate bias in evaluating findings.

Murray anticipates major findings only from longer observation. Rather than reexamination at the year's end, the study checks tuberculosis incidence and deaths in contacts' localities against the roster of participants and will periodically locate and thereby determine participants' general health status, possibly through commercial credit facilities.

In mental institutions, other studies covered 5,521 participants in 25 Wisconsin county hospitals and 8,360 patients in Milledgeville State Hospital. In Michigan, 3,800 are in an ongoing study, as are others in Massachusetts.

Murray observed that about 70 percent of the 85,000 new tuberculosis cases each year in this country may have been tuberculin positives before. Evidently, the disease is most often endogenous, he stated, citing in support a Danish study also indicating a higher risk for tuberculin positives than for negatives. This possibility and the constantly decreasing risk to tuberculin negatives make the prophylaxis studies especially relevant to tuberculin positive

subjects, he feels. If the studies' tuberculin positives are at decreased risk after year-long isoniazid intake, the drug will benefit markedly those now infected and indirectly cut the infection risk among those not infected, concluded Murray.

## **Few Bracero Health Views Changed by Work in U.S.**

Health attitudes and practices of contract farm laborers from Mexico, or braceros, are not significantly changed by work in the United States, according to a survey of 1,100 of such workers reported by Henry P. Anderson, research public health sociologist, School of Public Health, University of California, Berkeley.

Designed to yield demographic, theory-oriented, and program-oriented data for public health workers serving braceros, the project was financed mainly by a Public Health Service grant. Interviewing was conducted at the El Centro, Calif., reception center, which, Ander-

son pointed out, draws mainly from one of several areas supplying these workers. The control group was made up of braceros newly entering this country.

Findings showed that the typical bracero:

- Whether single or married, had about six dependents and came from a small town or village in which he had lived all his life.

- Tended to use medical services more for scientifically recognized diseases than for folk illnesses.

- In selecting type of therapy, was influenced by economic considerations.

- Tended to be unclear about disease prevention and preventive activities of health agencies.

- Knew about origins of venereal disease but not tuberculosis, which causes the greatest number of bracero rejections.

- In choosing a physician, valued efficiency and ease of communication over personal qualities.

## **Pond Receives Winslow Award**

M. Allen Pond, Assistant Surgeon General of the Public Health Service since 1958, has been presented with the C.-E. A. Winslow Award by the Connecticut Public Health Association.

The award, given annually to a Connecticut individual, group, or organization for an outstanding contribution in public health, is based on the ideals set by the late Charles-Edward Amory Winslow, bacteriologist, health educator, historian, pioneer in public health, author, and teacher.

Mr. Pond joined the staff of the Secretary of Health, Education, and Welfare in 1953, after serving 2 years as coordinator of community facilities services in the office of the Surgeon General. He has been a commissioned officer of the Public Health Service

since 1942, except during 1946-48 when he was assistant professor of public health at Yale University. In 1949 he was appointed chief of the Division of Engineering Resources.

Mr. Pond took a bachelor of science degree in 1935, and a master of public health degree the next year, from Yale University, where he continued on as a teacher of public health until 1942. He has been an officer in the American Public Health Association, the Yale Alumni in Public Health, and Loomis School Alumni Association.

A prolific author, he has served on the boards of *Public Health Reports*, the *Sanitarian*, and of official and private organizations connected with community building and planning.

# Current Concepts on Control Of Diarrheal Disease

MELVIN H. GOODWIN, JR., PH.D.

THE URGENCY of meeting the public health challenge presented by diarrheal disease in States on both sides of the Mexican border was emphasized in a report prepared at the 1958 meeting of the U.S.-Mexico Border Public Health Association. That report enumerated available control measures and outlined the necessity for more precise delineation of problems and for development of more precise procedures against specific pathogens. The present paper is related especially to one of the points covered in the report: What assumptions regarding etiology and epidemiology allow us to proceed to a control program where laboratory facilities are missing? Some of the implications to control are suggested by results available thus far from studies on the etiology of diarrheal diseases at Phoenix, Ariz.

## Recognized Pathogens

The work at Phoenix was designed to provide information on the current association of recognized pathogenic agents with diarrheal diseases. Previous studies in the southwest indicated the prominence of shigellae in the etiology of enteric infections. Investigations conducted by Hardy and Watt (1) from 1936 to 1938 indicated that these pathogens were isolated from 76 percent of the severe cases and 58 percent of the milder cases for all age groups. In recent years, cursory observations and a few studies specifically designed to determine what

etiological agents are currently responsible for diarrhea suggested that pathogens other than *Shigella* probably were of relatively more importance as causes of illness and death (2).

Infant deaths attributable to diarrheal disease in the United States receded from about 12,500 in 1941 to approximately 5,000 in 1956 (see chart). In the last few years, however, the rate of decline has diminished and the annual incidence appears to have stabilized at about 5,000 deaths. If this indicates that the maximum effectiveness of available control measures has been realized, further reductions in diarrheal diseases may depend upon development of more effective control methods or upon wider and more intensive application of existing measures. Prerequisite to either course is a redefinition of the problem based on knowledge of etiological agents currently responsible for diarrhea and of the appropriateness of available control measures for areas where problems are now most acute. Consequently, the first investigations at Phoenix were designed to determine the current association between recognized pathogens and diarrheal symptoms.

Results from initial studies, which were reported elsewhere in detail (3), may be summarized briefly. Intensive examinations for pathogenic enteric bacteria were made on specimens from 630 persons with symptoms of acute diarrhea for which treatment was sought. Approximately 67 percent of these persons were less than 1 year of age. Recognized bacterial pathogens were isolated by a single examination from 57 percent of the cases. *Shigella* organisms were recovered from 26 percent, enteropathogenic *Escherichia coli* from 31 percent, and *Salmonella* from 7 percent. About 90 percent of all enteropathogenic *E. coli* and 40 percent of the *Shigella* recovered were from infants less than 1 year old. The cases from which etiological agents were not recovered showed no characteristic distribution with respect to age of patient or month of occurrence.

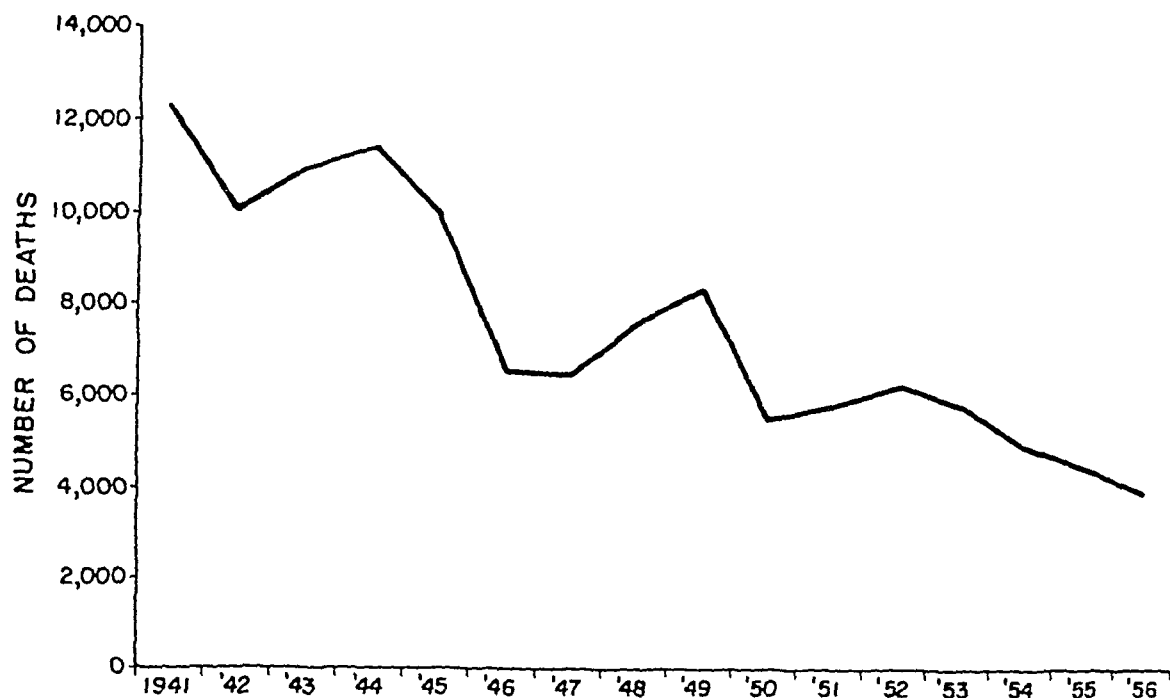
The need for further research is indicated by the fact that no recognized pathogens were detected in approximately half of the acute cases studied. In addition to searching for unrecognized pathogens, attention must be given also to the possibility of etiology unrelated to infectious agents. Not only were the

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*Dr. Goodwin, who is chief of the Phoenix Field Station Section of the Communicable Disease Center, Public Health Service, summarizes in this paper material he presented to the U.S.-Mexico Border Public Health Association meeting on March 31, 1959, in Brownsville, Tex.*

*A Spanish version in summary form appears in the February 1960 Boletín of the Pan American Sanitary Bureau.*

Number of diarrheal deaths among infants under 2 years of age, in the United States, from 1941 to 1956



majority of acute cases in the Phoenix studies in infants less than a year old, but the highest mortality from diarrhea characteristically occurred among infants during the first few months of life. Data available do not indicate whether or not the inherent virulence of specific pathogens associated with diarrhea of these young children is responsible for the high mortality or whether unfavorable prognoses result from other circumstances, for example, the rapid dehydration, malnutrition, or synergistic effect of other organisms. Furthermore, accumulation of additional information on the epidemiology of certain pathogens, *E. coli*, for example, is necessary to enable development of specific control measures.

### Control Measures

Obviously, continuing investigations and development of more effective control measures are necessary to achieve the ultimate goal of control and eradication of diarrheal diseases. Public health workers recognize, however, that much can be done in the meantime to meet current problems that should not wait until pro-

cedures are devised that assure attainment of the more remote objectives. Although its relative prominence has apparently diminished, *Shigella* still seems to be the dominant etiological agent of summer diarrhea in the areas investigated. Traditional control measures, such as provision of water supply within individual homes, general environmental sanitation, promotion of breast feeding, health education, and maternal and child care, are of proved value in reducing these infections. No new techniques are proposed on the basis of the work outlined here, but different methods for application of existing procedures are suggested which may enhance their effectiveness.

It should be remembered that as the amount of environmental contamination decreases, the relative importance of transmission by personal contacts apparently becomes more significant. While a great deal of further work is necessary to improve environmental conditions and reduce further the possibility of spread of diarrhea through inadequate excreta disposal and limited water supplies, it will be well to keep in mind that different techniques, many that are simple and easy to apply, may effec-

**Table 1. Frequency distribution by families of diarrheal episodes reported and of *Shigella* isolated from residents of Sacaton, Ariz., May 1954 through December 1958**

Number of episodes	Number of families	Cumulative number		Positive cultures for <i>Shigella</i>	Number of families	Cumulative number	
		Episodes	Families			Positive cultures	Families
50-----	1	50	1	20-----	1	20	1
41-----	1	91	2	17-----	2	54	3
36-37-----	2	164	4	15-----	1	69	4
				14-----	1	83	5
26-29-----	3	245	7	11-----	1	94	6
21-25-----	4	341	11	9-----	2	112	8
16-20-----	12	548	23	8-----	3	136	11
11-15-----	10	676	33	7-----	3	157	14
6-10-----	20	834	53	6-----	6	193	20
4-5-----	11	883	64	5-----	7	228	27
3-----	10	913	74	4-----	4	244	31
2-----	12	937	86	3-----	9	271	40
1-----	21	956	107	2-----	11	293	51
0-----	2		109	1-----	19	312	70
				0-----	39		109

tively decrease the amount of human contact with infectious material.

As the incidence of diarrhea is reduced, homogenous specific foci, which are evident even in areas of high incidence, become increasingly apparent. In any situation a small number of families in the community usually will be responsible for the majority of diarrheal diseases in a particular area. This is illustrated by data from Sacaton and Guadalupe, Ariz., where observations were made from May 1954 through December 1958 and from May 1954 through September 1957, respectively. The prevalence

of *Shigella* among children from 1 to 5 years of age was determined by monthly examination of fecal specimens collected by rectal swab. Data on morbidity experience of the entire population were obtained by monthly interrogation.

Tables 1 and 2 show the frequency with which episodes of diarrhea were reported and the rate of *Shigella* positive cultures in families of the communities. In Sacaton about 57 percent of the cases of diarrhea reported were from only 21 percent of the families. Approximately 62 percent of *Shigella* positive cultures were obtained from 18 percent of the families.

**Table 2. Frequency distribution by families of diarrheal episodes reported and of *Shigella* isolated from residents of Guadalupe, Ariz., May 1954 through September 1957**

Number of episodes	Number of families	Cumulative number		Number of positive cultures	Number of families	Cumulative number	
		Episodes	Families			Positive cultures	Families
44-----	1	44	1	22-----	1	22	1
33-----	1	77	2	10-----	1	32	2
29-31-----	2	137	4	8-----	2	48	4
21-25-----	12	412	16	6-----	3	66	7
16-20-----	8	555	24	5-----	6	96	13
11-15-----	21	820	45	4-----	12	144	25
6-10-----	55	1,256	100	3-----	25	219	50
5-----	18	1,346	118	2-----	33	285	83
4-----	25	1,446	143	1-----	58	343	141
3-----	26	1,524	169	0-----	155		296
2-----	42	1,608	211				
1-----	78	1,686	289				
0-----	7		296				



Similar patterns were apparent in Guadalupe. Here about 15 percent of the families reported approximately half of the diarrhea and 17 percent of the families provided 64 percent of the positive cultures. The vast majority of families had only a few episodes during the period of study. Obviously, the greatest effect of a community control program could be realized by working with the families having high rates. Programs of environmental sanitation particularly, and to some extent efforts to improve personal hygiene and provide health education, have been directed on a broad base to include all of the population. The same or less effort directed toward the relatively few families or premises that are infected most frequently, and consequently which probably contributed most of the infections, would probably achieve greater reduction in prevalence.

Families responsible for high rates can usually be singled out by public health and social workers after acquiring a superficial knowledge of the community. Further consideration of means for detecting the high rate in families may lead to development of more objective techniques.

The basic concept to emphasize is that regardless of the nature of control measures, it is usually possible to be selective in the places

of their application. The magnitude of the problem may often be discouraging when working with every premise or family in a community, but if the number can be reduced by a factor of 50 to 75 percent, the possibilities of achievement appear more realistic.

## Conclusion

Studies on etiology of diarrheal diseases in the Phoenix area have disclosed where further investigations are needed. The importance of additional information on epidemiology and etiology is recognized, but the need is not yet acute. Of more immediate concern, the results reemphasize that more intensive application of available techniques should further reduce morbidity and mortality attributed to diarrheal disease.

## REFERENCES

- (1) Hardy, A. V., and Watt, J.: Studies of the acute diarrheal diseases. XII. Etiology. *Pub. Health Rep.* 60: 57-66, Jan. 19, 1945.
- (2) Coleman, P. J., Richards, C. S., DeCapito, T. M., and Maier, P. P.: Observations on the etiology of diarrhea in two Arizona communities. (In press.)
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## WHAT DO THEY DO IN TOLEDO?

LATE MARKET REPORT: HEAVY DEMAND FOR WORD OF  
EXEMPLARY OR SUCCESSFUL PROCEDURES IN HEALTH  
DEPARTMENTS STOP CONTRIBUTIONS OF TWO HUNDRED  
TO TWO THOUSAND WORDS ACCEPTABLE STOP ACTION  
PICTURES WELCOMED STOP ADDRESS EDITOR PUBLIC  
HEALTH REPORTS USDHEW WASHINGTON 25 DC

## Translated Readings

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### *Preservation of Coccidia burnetii*

To determine possible time limits for persistence of secondary reservoirs of Q fever, V. F. Ignatovich, Moscow epidemiologist, studied factors affecting survival of *Coccidia burnetii* in cultures on wool, sand, mud, and sawdust under different conditions of temperature and humidity. Some cultures were viable after 6 months (30, 75).

### *Hungarian Pharmacy*

A review of research in the Hungarian Pharmaceutical Institute, by Gyula Horvath, Budapest, has been published in *Magyar kemikusok lapja* (30, 87).

### *Charges on Bacteria*

Using an apparatus of his own design, V. V. Vlodavets, Moscow, following suggestions of Prof. S. S. Mehmenskiy, was able to detect and distinguish between electrical charges on micro-organisms in air (29, 102).

### *Tolerance of HCl*

A concentration of no more than 0.05 mg. of HCl aerosols per cubic meter of air is recommended by Ye. V. Yel'fimova, Moscow, as a result of investigations which found a threshold of tolerance for the olfactory senses at 0.1–0.2 mg.; for optic chronaxy, 0.6 mg.; for vas-

cular reactions, 0.5 mg.; and for respiration, 0.1–0.2 mg. (23, 101).

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Kirov Military Medical Academy, and applied by K. M. Loban, Moscow, and K. A. Nurishchenko, Leningrad, with success. As described by K. Proshunin, treatment in one case consisted of intravenous administration of 60-70 mg. of diplacine to a woman patient, once or twice a day for 10 days. Artificial respiration was provided when necessary. After dosage, opisthotonus disappeared and pain and spasms subsided (24, 91).

### *Ear Surgery*

The gift of hearing to nine children born deaf is reported to result from surgical installation of an artificial eardrum by Professor Malamush of the Dzherzhinskiy Children's Clinic, Moscow (24, 117).

### *Carcinogens in Cured Meat?*

Certain smoke-curing processes in the meat industry in Leningrad introduced materials which, after ingestion, may facilitate cancer formation, according to A. Novikov, director of the Moscow Oncological Institute, quoted in *Magyar nemzet* of Budapest. On the basis of recommendations by Leningrad investigators, he said, the smoke-curing processes were revised (28, 97).

### *Air Filtration*

FP 5 and number 3 membrane filters for removing micro-organisms from the air were compared by Ye. Yu. Zuykova, Moscow. While both were effective, it was concluded that the FP filter is better for rapid filtration of large volumes of air, as it has less resistance to air currents and is less fragile than the membrane filter (28, 102).

### *Biological Gloves*

Protecting skin against solvents and synthetic tars, workers at the Gor'kiy factory, Krasnoye Sormovo, coat their hands with a paste made of 300 grams of casein gum extra, 10 grams of 25 percent ammonia, 300 grams of glycerine, 850 grams of alcohol, and 850 grams of water. The casein is dissolved in half the water, and ammonia in the remaining water, glycerine, and alcohol are added in that order. The paste forms a film on the hands. It washes off with warm water and soap (28, 104).

### *Brucellosis Vaccine*

Tests of a live vaccine against brucellosis are reported from Kazakhstan and Alma-Ata (27, 70).

### *Decontamination of Leather*

A 1 percent salt solution of chloramine in 30 minutes decontaminates hides infected with *Brucella*, without impairing the leather, reports K. Ye. Yedygenov, Alma-Ata (27, 85).

### *Effects of Exercise*

Exertion's effects on bone and muscle were analyzed in a systematic study carried on for 10 years by M. G. Prives, who holds the chair of normal anatomy in the Leningrad medical institute named for Pavlov. Prolonged exertion produces marked changes, especially in the diaphragm. Phosphorus is deposited in the bones that carry the greater physical load, the substantia compacta thicken, and the bone marrow cavities are reduced. If a person changes to an occupation that requires less exertion, the symptoms of hypertrophy decline. The measurements were conducted with the aid of X-ray and radioactive trace elements (27, 82).

### *Data on Poisons*

Toxicological data on certain organophosphorus compounds in relation to their chemical structure have been published by Yu. S. Kagan (26, 82).

### *Public Health Progress*

A book on public health in the U.S.S.R. and achievements of Soviet medicine is reviewed, apparently by CIA, with an effort to summarize the contents of 124 pages. The authors are Nikolay Ivanovich Grashchenkov and Yuriy Pavlovich Lisitsyn. The review says: "It can be gathered from the text that technical changes . . . parallel the development of national economy." The table of contents gives 14 pages to conditions in Czarist times, 25 pages to the October Revolution and its plans for protecting the health of workers, 10 pages to prophylaxis, 14 to an attack on infections, 4 to the prospect of eradicating tuberculosis, 13 to conditioned reflexes, 11 to cardiovascular diseases, 5 to cancer, 3 to blood banks,

4 to new drugs, and 5 to international medical relations. There is no chapter on environmental health services (22, 86).

Soviet authorities have scheduled graduation of 13,700 sanitary physicians, specializing in hygiene and sanitation, for the 5-year period ending 1960. In the previous 5 years, 8,900 were graduated. In the period ending 1965, the number to be graduated will exceed 10,000. It is asserted, "This will satisfy the needs of the Soviet population as far as sanitary epidemic control is concerned." The physicians are trained in 19 sanitary hygiene faculties of medical universities (15, 43).

Public health progress in the Turkmen S.S.R. is the subject of a book by M. G. Berdyklychev, reviewed by P. P. Radkin. He notes that only 20 years ago malaria and trachoma constituted 40 percent of the total incidence of disease in the Republic, whereas these afflictions today are not appreciable. Pappataci fever and typhus have been eradicated (19, 108).

A report on developments in Polish health in the last 15 years has been published by Dr. B. Kozusnik, deputy minister of health, Polish People's Republic (29, 118).

#### *Pasteurella tularensis* Strains

Differences in tularemia pathogen strains were analyzed by N. F. Olsuf'yev, O. S. Yemel'yanova, and T. N. Dunayeva, Moscow. The virulent Schu strain, acquired from American investigators in California and Kansas, was compared with virulent strain 503, isolated from *Dermacentor pictus* Herm ticks by N. G. Olsuf'yev in 1949 (28, 92).

#### *Tickborne Encephalitis Virus*

Tickborne encephalitis virus was preserved in cow's milk at refrigerator temperatures. In

sour cream and butter, the virus was preserved for 2 months, by M. Gresikova Kohutova, Czechoslovakia (29, 103).

#### *Radiotherapy*

A review of medical applications of radio-nuclides in the U.S.S.R. is summarized by Prof. A. Kozlova, Moscow (29, 111).

#### *Antihemorrhagic Drug*

Poison from the guersa snake was used to create a drug 10 times as effective in halting bleeding as that derived from the Indian viper, doloja. The drug was developed at the Stalinabad Medical Institute (29, 115).

#### *Carbon 14 in Tobacco Tar*

After burning 101 cigarettes, J. R. Chojnowski and A. Dorabalska, in a study conducted in Poland, found that 1 gram of carbon from tobacco tar emitted 154 pulses of radiation a minute. In contrast, carbon from carbon dioxide emitted 95 pulses, and that from carbon monoxide emitted only 62 (20, 71).

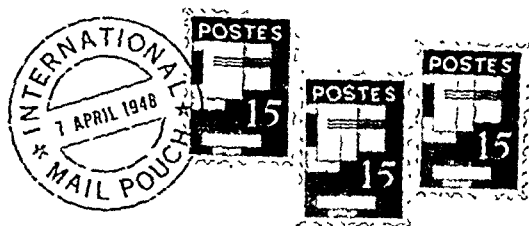
#### *Mental Therapy*

Properties of a variety of drugs used in psychotherapy are reviewed by Karl Libering, Yugoslavia (20, 90).

Prospects for development of Soviet psychiatry in the next 7 years are described by V. A. Gilyarovskiy, Moscow (19, 106).

#### *Sonic Aerosols*

Use of ultrasonic atomizers in the prophylaxis and therapy of diseases requiring aerosol treatment is discussed by A. P. Livenson, Moscow. The bibliography contains seven titles (19, 82).



## Fifteen Cents

Nearly 6 million people in Ceylon are protected against malaria at an annual cost of 15 cents per capita. The 1958 report of the antimalaria campaign lists 114 vigilance and subvigilance units and 38 mobile spray units at work. A total of 624 persons are engaged in eradication activities.

Only 27 persons were reported to have died from the disease in 1958, and positive blood smears from fever cases decreased from 6.4 percent of 105,957 smears in 1957 to 1.6 percent of 63,866 smears in 1958.

During the year U.S. Operations Mission in Ceylon contributed supplies, materials, and equipment including 34 jeeps, 7 carriers, and a station wagon to the antimalaria campaign. Dr. L. F. Gunaratna, who joined the campaign in 1946, superintended eradication activities from May 1955 until his death in September 1958. Dr. T. Visvalingham succeeded him as superintendent.

—TROIS E. JOHNSON, M.D., *former chief public health adviser, U.S. Operations Mission, Ceylon.*

## Pilot Study in Laos

Last June we started a pilot study to determine the best way to distribute pyrimethamine, a malaria suppressant, to the primitive groups in Laos. Supplies of the drug were given to three voluntary agencies.

The MEDICO clinic at Muong Sing is giving tablets to several hundred persons, including an army detachment nearby. The staff has also sprayed some 70 houses, using the DDT and sprayers supplied by our mission.

The nurse on the International Voluntary Service team at Phon Savanh is giving the tablets to more than 300 people weekly. She reported that headmen from remote villages are coming to ask for the drug.

The eight clinics run by Operation Brotherhood are supplying pyrimethamine to some 6,000 persons for a 6-month period. Also, the physician for

USOM personnel is giving tablets to 150 villagers and a member of the agriculture department asked for a supply for the staff of the USOM pig farm.

Although the pilot study includes less than 10,000, we expect to gain some valuable information on how to sell malaria prophylaxis and can evolve a workable system for distribution on a larger scale in the future.

Before the pilot study started, antimalarial activities in Laos were strictly a Government function with USOM advice and funding. Now other agencies are eager to participate.

—MANLY B. DONALDSON, M.D., *chief, public health division, and* MAYNARD S. JOHNSON, Ph.D., *malariaologist, U.S. Operations Mission, Laos.*

## Resettling Workers

Displaced miners and factory workers from Altiplano mining centers in Bolivia will be settled on farmlands in the tropical highlands of Yungas, 170 kilometers from La Paz. Servicio Cooperativo Interamericano de Salud Pública is cooperating by planning, constructing, equipping, and staffing hospital-health centers in Caranavi, Circuata, and Coroico, which will serve about 25,000 people within 5 years.

—MARCUS P. QUINN, *acting director, Servicio Cooperativo Interamericano de Salud Pública, Bolivia.*

## Rehabilitation Teams

The Government of Colombia is sending rehabilitation teams to bolster "all areas of human life" into regions where severe economic and social problems remain as the result of years of political and civil violence.

Following visits to these areas by survey teams and arbiters, the Government made plans to recruit rehabilitation teams. Each will have a physician, nurse, civil engineer, two agricultural extension workers, and a home demonstration agent.

We were asked to help train the teams and are giving them 9 hours of instruction in health education, 1 each in nutrition and industrial health, 2 each in sanitation and public health nursing, and 3 in community organization.

—E. E. MINTY, *acting director, public health division, U.S. Operations Mission, Colombia.*

# Federal Publications

**A Composite Method for Estimating Postcensal Population of Small Areas by Age, Sex, and Color.** *Vital Statistics—Special Reports; Selected Studies*; vol. 47, No. 6, pages 161-185; Aug. 24, 1959; by Donald J. Bogue and Beverly Duncan.

A comparatively simple, inexpensive technique for preparing specific current local-area estimates sufficiently reliable for most planning and policymaking uses and for studies of population trends is outlined.

The rationale of the method, procedures for making estimates, accuracy of estimates, possible refinements, and indirect estimates are discussed.

The text is supported by nine tables and a line graph.

**Maternal Disorders Related to Fetal Stress, Perinatal Death, and Congenital Defects.** Selected references, 1952-58. *PHS Publication No. 669 (Public Health Bibliography Series No. 25)*; 1959; compiled by Elizabeth Koenig; 33 pages; 15 cents.

Four hundred and thirteen references to English language studies have been compiled for medical and public health workers interested in the prevention of reproductive wastage.

Infectious diseases are emphasized. Studies on metabolic, neurological, collagen, and blood disorders, drug effects, and statistical data are included.

**Municipal and Industrial Waste Facilities, 1957 Inventory.** A cooperative State-Federal report. *PHS Publication No. 622*; 1959; vol. 1, 65 cents; vol. 2, \$1.75; vol. 3, \$1; vol. 4, \$1; vol. 5, \$1.75; vol. 6, \$1.25; vol. 7, \$1; vol. 8, 60 cents; vol. 9, \$1.25; the set, \$10.25.

Data of significance in water pollution control programs and waste treatment facilities are segregated into nine volumes according to De-

partment of Health, Education, and Welfare regions. Material in each volume is arranged by State and alphabetically by community. The volume numbers correspond with the region numbers.

**Highlights of Research Progress in Allergy and Infectious Diseases, 1958.** *PHS Publication No. 694*; 1959; 68 pages; 30 cents.

Significant research accomplishments in intramural and grant-supported projects of the National Institute of Allergy and Infectious Diseases are described briefly. Subject areas include allergy-immunology, virus diseases, cell biology, and parasitic diseases.

Discussions of staphylococcal and cystic fibrosis research, the Middle America Research Unit in Panama, the respiratory virus study in Antarctica, and various special studies are also presented.

**Public Health Service Grants and Awards by the National Institutes of Health, Fiscal Year 1959.** Health research facilities construction and research grants. *PHS Publication No. 701, part 1*; 1959; 318 pages; \$1.

Grants for health research facilities and for research projects are listed separately by State and institution. A summary table of research grant support by the individual institutes and the Division of General Medical Sciences shows the distribution of grants by State and grantee institutions. The total number and amount of grants to each institution and each State are included in the directory of individual research investigators.

**Film Reference Guide for Medicine and Allied Sciences.** *PHS Publication No. 487*; 1959; 192 pages; \$1.

Approximately 2,000 up-to-date films and filmstrips produced and in use by agency members of the Interdepartmental Committee on Medical

Training Aids are listed. Also included are productions of civilian agencies or individuals useful to member agencies.

A brief description under each title includes an abstract of the film's content. An alphabetical list of distributors and instructions for borrowing films are provided.

**Dental Care in a Group Purchase Plan.** A survey of attitudes and utilization at the St. Louis Labor Health Institute. *PHS Publication No. 684*; 1959; 68 pages.

Dental treatment sought from a group clinic by Teamsters' Union members and their families is analyzed in relation to family size, race, income, educational levels, and attitudes toward dental care. The need for dental health education is emphasized.

**Poultry Hygiene.** Examination and evaluation of poultry and poultry products. *PHS Publication No. 688, part 1 (FDA Technical Bulletin No. 2)*; 1959; 55 pages; 40 cents.

Procedures for antemortem and postmortem inspection of poultry are recommended to officials conducting poultry hygiene programs and as a guide for training lay inspectors and plant personnel.

Included are discussions of 33 diseases and undesirable conditions, significance of specific findings, and disposition of carcasses.

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This section carries announcements of new publications prepared by the Public Health Service and of selected publications prepared with Federal support.

Unless otherwise indicated, publications for which prices are quoted are for sale by the Superintendent of Documents, U.S. Government Printing Office, Washington 25, D.C. Orders should be accompanied by cash, check, or money order and should fully identify the publication. Public Health Service publications which do not carry price quotations, as well as single sample copies of those for which prices are shown, can be obtained without charge from the Public Inquiries Branch, Office of Information, Public Health Service, Washington 25, D.C.

The Public Health Service does not supply publications other than its own.

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## AN EPIDEMIOLOGICAL STUDY OF ENDEMIC TYPHUS (BRILL'S DISEASE) IN THE SOUTHEASTERN UNITED STATES

WITH SPECIAL REFERENCE TO ITS MODE OF TRANSMISSION

By KENNETH F. MAXCY, Passed Assistant Surgeon, United States Public Health Service

At the beginning of this century it was generally held that typhus fever had disappeared from the United States except for an occasional case imported from Europe or from Mexico.<sup>1</sup>

In 1910 Dr. Nathan E. Brill (1898, 1910, 1911), of New York, called attention to a typhuslike disease occurring endemically in that city. He hesitated to identify it as typhus because of its generally milder course and its occurrence under circumstances different from those usually associated with that disease. He accordingly believed that he was dealing with a new clinical entity, "an infectious disease of unknown etiology." Cases of this type have since been known in the United States as Brill's disease.

In 1912 Anderson and Goldberger, who had previously reported on the experimental transmission of Mexican typhus ("tabardillo") to monkeys, were similarly successful in the inoculation of a Rhesus monkey with blood from a case of Brill's disease in New York. They found that, as in "tabardillo," one infection rendered monkeys immune to subsequent inoculations of the same passage virus. Furthermore, monkeys previously infected with Mexican typhus were thereafter found immune to Brill's disease, and vice versa. From these observations they concluded that Brill's disease was, in fact, identical with typhus fever, and this conclusion seems to have been quite promptly and generally accepted.

<sup>1</sup> August Hirsch, in his "Geographical and Historical Pathology" (Pub. by the New Sydenham Society, London, 1883), states that:

The proper era of typhus for the United States and Canada begins with the period when immigration from Ireland had set in on a large scale. We thus explain the fact that the ports on the east coast of North America have been the headquarters of the disease, and that the largest contingent of the sick has been supplied by the immigrants themselves, or their countrymen with whom they had come in contact. On the other hand, it is a noteworthy fact that the most careful search among the plentiful epidemiologic records in the literature of the United States fails to discover a single statement as to the occurrence of typhus in the Mississippi Valley or in the Western States, so that the greater part of the continent appears

DECEMBER 24, 1926, pp. 2967-2995

A systematic and thorough account by Dr. Kenneth F. Maxcy of a study of Brill's disease in southern Alabama and Savannah, Ga., confirms its endemic character and points out differences in epidemiological characteristics from those of typhus in the "Old World."

# Factors in Diagnosis and Classification of Deaths from CVR Diseases

IWAO M. MORIYAMA, Ph.D.

OVER one-half of the deaths occurring annually in the United States are attributed to cardiovascular-renal diseases (CVR). As may be seen from table 1, the largest frequency of deaths is found in the component arteriosclerotic heart disease including coronary disease. Next in frequency are vascular lesions affecting the central nervous system, and the hypertensive diseases. With the decline in mortality from infectious diseases generally, cardiovascular diseases of infective origin now constitute less than 5 percent of the total CVR disease mortality.

Marked differences in death rates appear for the various demographic characteristics as well as geographic areas. The reasons for these differences are not all clear. Nor is there agreement that the recorded differences are real. Some feel that the problems of diagnosis, reporting, and classification of these diseases are of such a nature that no valid assessment of mortality trends and differentials is possible. Others feel that despite the shortcomings of the data, mortality statistics provide useful indicators of the general trend and magnitude of CVR disease mortality. This disagreement is rooted in the lack of quantitative information with respect to these problems.

Various factors complicate the interpretation of CVR disease mortality statistics. First, there is the question of the reliability of the

diagnostic data on which the medical certification of causes of death is based. There are several facets to this problem. The prevailing concept of disease and diagnostic criteria of the day provide the background for medical practice. The amount and quality of diagnostic evidence available to the medical certifier, and the diagnostic acumen of the attending physician determine the quality of diagnosis made. At this point, it should be recognized that diagnoses are judgments arrived at after a study of available clinical and pathological observations. Even with standard diagnostic criteria, it is highly unlikely that absolute accuracy in diagnosis will ever be possible for diseases of the CVR system because of the varying medical backgrounds and experience of the relatively large population of physicians.

There can be no question that over the years there has been a great increase in knowledge with resultant changes in the concept of cardiovascular-renal diseases. The development of diagnostic criteria and techniques and improvements in diagnostic facilities and methods have undoubtedly influenced cardiovascular-renal disease mortality statistics. For example, the diseases of coronary arteries which today are the most important component of the CVR disease complex were not reported with any great frequency as a cause of death until about 1926. Halsey, cited by Hedley (1) and Atkinson (2), has pointed out that there has been a change in emphasis in the diagnosis of heart disease away from valvular to myocardial diseases and more particularly to the coronary vessels which supply the myocardium. Levy's review (3) of the clinical and pathological rec-

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**Table 1. Number of deaths and death rates for the components of major cardiovascular-renal diseases, United States, 1956**

Major cardiovascular-renal diseases	Number of deaths	Rate <sup>1</sup>	Percent
Total-----	854, 152	510. 7	100. 0
Vascular lesions affecting central nervous system	177, 845	106. 3	20. 8
Rheumatic fever and chronic rheumatic heart disease-----	20, 029	12. 0	2. 3
Arteriosclerotic heart disease, including coronary disease-----	427, 516	255. 6	50. 1
Other heart disease, except hypertensive----	84, 090	69. 5	9. 8
Hypertensive diseases-----	83, 341	49. 8	9. 8
Other cardiovascular-renal diseases-----	61, 331	17. 5	7. 2

<sup>1</sup> Rate per 100,000 estimated population.

ords of the New York Presbyterian Hospital for the period of 1920 to 1930 showed that although the incidence of coronary disease in the pathological records was fairly constant each year (10 to 12 percent) throughout the decade, there was an increase of 400 percent in the frequency of clinical diagnosis of various forms of coronary diseases. Levy states that "It was after the publication of the papers of Herrick in 1912 and again in 1919 that interest of the profession in this country was aroused in the problems of acute coronary obstruction, and in the succeeding years clinicians became more alert in recognizing the disturbance in the coronary circulation and recorded them more frequently."

Other significant changes in the concept of CVR diseases relate to the vascular changes caused by diabetes (4) and the possible etiological relationship between cholesterol and atherosclerosis. The role of hypertension and the effects of therapeutic procedures on hypertensives are beginning to be better understood. These developments have an impact upon the diagnosis of CVR diseases, but it is not possible to determine the extent to which the statistics on CVR disease mortality are influenced. Undoubtedly, however, data on the individual components of the CVR disease complex are significantly affected. On the other hand, most of the shifts are within the CVR system, and

mortality data for all CVR diseases are probably relatively free from complications resulting from these changes in concept.

A number of studies have explored the accuracy of cause-of-death statements on death certificates (5-7). On the basis of comparisons between clinical and pathological records, the diagnostic statements relating to CVR diseases have been found in these studies to be relatively poor. Those investigations which utilize autopsy findings as the standard of reference have *serious limitations*. For example, diagnoses of clinical entities cannot always be established by autopsy findings. In the study of James and associates (7), the use of autopsy data decreased the proportion of deaths attributed to such causes as diabetes and hypertensive diseases and increased the proportion attributable to arteriosclerosis.

Deaths of patients in hospitals tend to be weighted with surgical cases, acute illnesses, and diseases and conditions relatively difficult to diagnose. Pathological findings are sought more often for deaths where the clinical diagnosis is not clear or where diagnostic confirmation is desired. Thus, the selection of deaths in hospitals, particularly deaths for which autopsies were performed, should lead to greater disagreement than would appear in a hypothetical situation where cause-of-death statements are compared with clinical or pathological findings.

### Pennsylvania Study

In order to avoid the selective factors involved in the study of hospital deaths that come to autopsy, the medical certifier was queried in a sample of death certificates issued in hospitals for a 3-month period in 1956 in Pennsylvania. The methodology and results of this study were published recently (8). Briefly, the method of study was to send a questionnaire to the physician signing the death certificate asking for information on diagnostic methods, the pertinent findings on which the medical certification of death was based, and an expression of his certainty of the diagnosis on the medical certification. The returns were reviewed by an internist and rated as to quality (type and amount) of supporting

**Table 2. Quality (type and amount) of supporting diagnostic information on cardiovascular-renal diseases, Pennsylvania mortality sample, 3-month period, 1956<sup>1</sup>**

Major cardiovascular-renal diseases	Total number	Percent			
		Very good	Good	Sketchy	No report
Total.....	1, 406	28. 7	19. 8	47. 4	4. 1
Intracranial lesions of central nervous system.....	254	20. 9	23. 2	51. 2	4. 7
Rheumatic fever and rheumatic heart disease.....	41	58. 5	19. 5	14. 6	7. 4
Arteriosclerotic heart disease including coronary disease.....	692	29. 8	17. 6	49. 0	3. 6
Other heart disease, except hypertensive disease.....	167	17. 4	16. 2	64. 1	2. 3
Hypertensive diseases.....	150	30. 7	27. 3	36. 0	6. 0
Other cardiovascular-renal diseases.....	102	45. 1	21. 6	29. 4	3. 9

<sup>1</sup> Totals adjusted to number of deaths in current mortality sample.

diagnostic information and consistency of medical certification with the diagnostic evidence. Also, the reviewing internist rated his impression of certainty of the diagnosis.

The findings on CVR diseases may be summarized as follows:

1. A relatively large proportion (47 percent) of the available diagnostic information on CVR diseases was sketchy (table 2); in 20 percent, it was "good;" and in 29 percent, "very good." In 4 percent, there were no returns on which to make an assessment.

2. Analysis of evidence presented in 1,406 deaths in support of a diagnosis of the major CVR diseases judged the certified diagnosis most probable in 78 percent of the deaths, an-

other diagnosis equally probable in 14 percent, and a different diagnosis preferred in 3 percent (table 3). No diagnostic information was available in the remaining 4 percent. These figures may to some degree understate the quality of medical certifications of deaths from CVR diseases since judgments were made on the specific diagnoses reported. Some classified as "another diagnosis equally probable" or "another diagnosis preferred" could well have been the "most probable diagnosis" had the cause-of-death statement referred to another related disease within the cardiovascular-renal system. With respect to the specific diagnoses, the proportion of medical certifications judged to be the "most probable diagnosis" ranged from 67

**Table 3. Consistency of medical certification with diagnostic evidence on cardiovascular-renal diseases, Pennsylvania mortality sample, 3-month period, 1956<sup>1</sup>**

Major cardiovascular-renal diseases	Total number	Percent			
		Most probable diagnosis	Another diagnosis equally probable	Another diagnosis preferred	No diagnostic information
Total.....	1, 406	78. 2	14. 4	3. 3	4. 1
Vascular lesions of central nervous system.....	254	85. 0	8. 7	1. 6	4. 7
Rheumatic fever and rheumatic heart disease.....	41	82. 9	9. 8	0	7. 3
Arteriosclerotic heart disease including coronary diseases.....	692	78. 6	16. 5	1. 3	3. 6
Other heart diseases, except hypertensive.....	167	66. 5	19. 8	11. 4	2. 3
Hypertensive diseases.....	150	76. 0	16. 0	2. 0	6. 0
Other cardiovascular-renal diseases.....	102	78. 4	5. 9	11. 8	3. 9

<sup>1</sup> Totals adjusted to number of deaths in current mortality sample.

percent for "other heart diseases, except hypertensive" to 85 percent for the vascular lesions affecting the central nervous system.

3. The reviewer's evaluation of the diagnostic information on deaths certified by physicians indicated that diagnosis was solidly established in 33 percent of the CVR deaths, and reasonably well established in 47 percent of the deaths (table 4). In other words, in 80 percent of the deaths from CVR diseases, the diagnoses were evaluated to be reasonable or better. There was more uncertainty concerning the accuracy of diagnoses of deaths from hypertensive diseases and the residual group of CVR diseases. The query form was probably weakest in eliciting clinical evidence which, in part, may account for the lower proportion of solidly established and reasonable diagnoses for these rubrics.

4. A relatively large proportion (15 percent) of deaths from CVR diseases in Pennsylvania was certified by the medical examiner or coroners. This proportion was much higher (31 percent) for coronary heart disease, which is frequently linked with sudden death. The care with which the medical examiner and coroners discharge their legal responsibilities can significantly affect statistics for CVR disease mortality. In Pennsylvania, at least, the coroners or medical examiner often consult the family physician, if there is one, before making out the medical certificate, or, if the reasons for death seem unclear, an autopsy is ordered.

5. The differences in diagnostic quality do

not appear to be important factors in the interpretation of sex and age differentials, in the more usual situation where the interest is in reasonable diagnosis or better.

6. Data by place of residence of the decedent showed slight differences by population size; but these do not seem large enough to account for much of the observed urban-rural differences in mortality.

7. There seemed to be a marked urban-rural difference in the quality of diagnoses according to the physician's place of practice. About 80 percent of the diagnoses of urban medical practitioners were rated as "solidly established" or "reasonable," while 70 percent of the diagnoses of their rural colleagues fell into those categories.

The establishment of an adequate diagnosis is important, but for the purposes of mortality statistics, diagnostic information must also be reported properly on the death certificate. This requires a complete statement of the judgment of the medical certifier on the sequence of events leading to death, in unambiguous medical terminology. Unless all of the pertinent facts are reported completely in the proper sequence, accurate and consistent classification becomes difficult.

In the Pennsylvania study, the diagnostic information on CVR diseases was reported "completely" by physicians on 84.7 percent of the death certificates (table 5). On 11.8 percent, the medical certification was incomplete in some respects. For example, an intervening

**Table 4. Reviewers' evaluation of diagnostic information on cardiovascular-renal deaths certified by physicians, Pennsylvania mortality sample, 3-month period, 1956<sup>1</sup>**

Major cardiovascular-renal diseases	Total number	Percent			
		Solidly established diagnosis	Reasonable diagnosis	Diagnosis in doubt	Diagnosis probably wrong
Total.....	1, 194	32.8	46.5	10.3	6.0
Vascular lesions of central nervous system.....	236	31.8	53.8	7.2	2.1
Rheumatic fever and rheumatic heart disease.....	38	58.0	23.7	7.9	2.6
Arteriosclerotic heart disease.....	260	30.0	51.9	9.2	3.5
Heart disease specified as involving coronaries.....	271	39.1	45.0	10.7	3.0
Hypertensive diseases.....	128	32.8	40.6	16.4	3.1
Other cardiovascular-renal diseases.....	261	26.4	42.1	11.1	17.2

<sup>1</sup> Total adjusted to number of deaths in current mortality sample. Deaths with no reported information are included in the total but not distributed in the percentages shown.

**Table 5. Percent completeness of medical certifications of cardiovascular-renal diseases, Pennsylvania mortality sample, 3-month period, 1956<sup>1</sup>**

Major cardiovascular-renal diseases	Physicians' returns					Medical examiner's and coroners' returns				
	Total number	Percent				Total number	Percent			
		Complete	Incomplete	Grossly incomplete	Incorrect		Complete	Incomplete	Grossly incomplete	Incorrect
Total.....	1, 142	84.7	11.8	1.9	1.6	206	70.4	26.2	1.0	2.4
Intracranial lesions of central nervous system.....	224	91.5	7.6	0	.9	18	66.7	33.3	0	0
Arteriosclerotic heart disease including coronary diseases.....	511	88.3	10.6	0	1.2	156	67.9	29.5	1.3	1.3
Other heart diseases, except hypertensive.....	191	72.3	16.8	9.4	1.6	10	100.0	0	0	0
Hypertensive diseases.....	119	87.4	12.6	0	0	19	89.5	10.5	0	0
Other cardiovascular-renal diseases.....	97	71.1	17.5	4.1	7.3	0	-----	-----	-----	-----

<sup>1</sup> Totals do not include reports on which diagnostic information not received and not adjusted to number of deaths in the current mortality sample.

cause in the sequence of events was omitted. A few, 1.9 percent, were grossly incomplete. On 1.6 percent, the diagnostic information was judged to be reported incorrectly. As might be expected, the proportion of medical certificates completely reported by the medical examiner and coroners was lower (70.4 percent). However, the proportion adjudged grossly incomplete and incorrect did not differ significantly from that for reports by private physicians.

The reporting of sequence of events was

generally good, despite the difficulties involved in determining the relationship between the various components of CVR diseases. As may be seen in table 6, about 94 percent of the certifications of CVR diseases by physicians represented correct or substantially correct sequence. The terminology used was also generally good, except in the group categorized as "other diseases of the heart, except hypertensive." Here the persistent use of the obsolete term "chronic myocarditis" resulted in a high proportion of reports by certifying

**Table 6. Percent of cardiovascular-renal disease reported by physicians in proper sequence of events using good or bad terminology, Pennsylvania mortality sample, 3-month period, 1956<sup>1</sup>**

Major cardiovascular-renal diseases	Total number	Correct sequence			Substantially correct			Incorrect sequence		
		Total	Good	Bad	Total	Good	Bad	Total	Good	Bad
Total.....	1, 142	90.5	84.1	6.4	3.4	2.5	0.9	6.0	5.1	0.9
Intracranial lesions of central nervous system.....	224	94.3	90.2	4.1	2.2	1.8	.4	3.6	3.6	0
Arteriosclerotic heart disease including coronary diseases.....	511	89.9	86.0	3.9	4.5	3.5	1.0	5.7	4.9	.8
Other heart diseases, except hypertensive.....	191	86.6	67.5	19.1	5.2	3.1	2.1	7.4	5.8	1.6
Hypertensive diseases.....	119	92.4	88.2	4.2	0	0	0	7.6	4.2	3.4
Other cardiovascular-renal diseases.....	97	91.8	91.8	0	0	0	0	8.2	8.2	0

<sup>1</sup> Totals do not include reports on which diagnostic information not received, and not adjusted to number of deaths in current mortality sample.

physicians being cited by the reviewer as poor terminology. In Pennsylvania, the reporting of CVR diseases by medical examiner and coroners does not appear to present much of a problem. This may not be the case in other parts of the country.

The medical certifier provides the information which forms the basis of cause-of-death statistics. For statistical purposes this information is classified according to certain prescribed rules, by the current categories of the International Lists of Diseases and Causes of Death. For primary mortality tabulations, it is necessary to select a single cause which is presumably the disease or condition which initiated the train of events leading to death. In CVR diseases, the cause so selected is frequently modified by the special provisions in the classification. Thus, data on certain presumptive etiological factors are lost. For example, "cerebral hemorrhage due to hypertension" is classified as intracranial lesions of vascular origin, and the presence of hypertension does not appear in the tabulations.

The problems of classification have been described elsewhere (9-13). Aside from the difficulties in adequately characterizing the diseases of the CVR system by selecting a single underlying cause, the decennial revisions of the international lists limit severely the compilation of a comparable series of statistics for the specific components of the CVR diseases. However, in view of the fact that revisions of the classification generally entail further subdivisions of CVR diseases and transfers within the CVR system, comparability of statistics for all CVR diseases has not been affected materially over the years.

## Conclusions

The situation with respect to the interpretation of CVR disease mortality statistics in the United States appears to be as follows:

1. Available data on the accuracy of diagnosis and of medical returns on death certificates are fragmentary and have certain limitations. The relative dearth of good supporting diagnostic information appears to be a problem in CVR mortality, but the Penn-

sylvania study suggests that the quality of diagnosis as reported on death certificates is for the most part reasonably good or better.

2. The universal adoption of diagnostic criteria such as those of the New York Heart Association (14) would materially improve the diagnostic information on death certificates. However, absolute and unfailing accuracy of diagnoses is unattainable. The etiological and pathological relationships in CVR diseases are often complex, and there is little opportunity for the medical certifier to make a thorough antemortem examination in a large proportion of deaths, say from coronary disease, because the patient dies suddenly.

3. Despite the various shortcomings of mortality data for the specific components of CVR diseases, data for the total complex of CVR diseases appear reliable for interpretation of mortality trends. More information is needed on a national scale and further work should be done to explore the factors of geographic distribution.

4. Because of the periodic revisions in classification, the study of the course of mortality of the components of CVR diseases will have to be limited necessarily to short-run analyses.

5. There should be a more general recognition that mortality data are not precise measures, but that in epidemiological studies they are useful in suggesting leads to be elaborated by other study approaches.

6. Preparatory work is now underway for the 8th revision of the International Lists of Diseases and Causes of Death. It is expected that the classification will provide for a greater number of disease complexes in the section on diseases of the CVR system. This will eliminate some of the troublesome factors in satisfactorily characterizing CVR diseases now encountered in primary mortality tabulations. However, it will not be possible to identify all the significant relationships. For this purpose, there will be a need for multiple-cause tabulations.

7. There has been a growing interest in studies of CVR disease mortality on an international scale involving various ethnic groups, in order to identify some of the etiological factors. A study group of the World Health

Organization is now developing diagnostic criteria for international use. Continuing interest in this area should be helpful in improving CVR disease mortality statistics.

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### World Health Day, April 7

The theme of World Health Day 1960, observed each year on April 7, is "Malaria Eradication—A World Challenge."

The Public Health Service will supply, upon request, program materials and background information on the World Health Organization, the history and current status of malaria throughout the world, and the progress which has been made in the worldwide malaria eradication effort. The Public Health Service also has an International Health Speakers' Bureau which includes prominent individuals throughout the United States who have been active in international health affairs and who have indicated their willingness to speak on World Health Day programs.

Requests for this material, or for other specific information about international health organizations or United States participation in international health programs, should be directed to the Assistant to the Surgeon General for International Health, U.S. Public Health Service, Department of Health, Education, and Welfare, Washington 25, D.C.

April 7 is the anniversary of the day on which the World Health Organization came into being. WHO, established in 1948, is one of the specialized agencies of the United Nations, with membership of 90 countries.



# Assay of Tests for Syphilis on Unheated Serum

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A METHOD for testing unheated serum in the same manner as plasma in the rapid plasma reagin (RPR) test (1) has recently been reported in which the comparative results obtained with this method and several other procedures on specimens from a serologic survey conducted in North Carolina, are described (2). An earlier method employing measured amounts of unheated serum and RPR antigen suspension, and referred to as the unheated serum reagin (USR) test, was included among the nontreponemal tests performed in the SERA study (3).

The establishment of a serum bank of clinically categorized donors at this laboratory has been previously described (4). Its availability has made possible the rapid assay of newly published procedures, and it has again been used in this study.

This report presents the comparative results obtained with the two procedures performed on unheated serum and the VDRL slide test on serums from medically defined patient groups.

## Materials and Methods

The rapid plasma reagin test on unheated serum (RPR-US) was performed in exactly the same manner as the RPR test (1) except that serum was substituted for plasma.

The unheated serum reagin test was per-

formed according to the technique described in the SERA study (3).

The VDRL slide test was performed in accordance with the technique described in the Manual of Serologic Tests for Syphilis, 1959 revision.

All tests were performed at the Venereal Disease Research Laboratory, Chamblee, Ga. VDRL slide test results on those serums that were included in both the SERA study and the serum bank were taken from the SERA study report. The two tests on unheated serum were run on all the specimens at a later date. VDRL slide tests were performed at the same time on any specimens added to the bank which had not been included in the SERA study.

The donors of the serums tested were in the following categories:

## PRESUMED NONSYPHILITIC

- Apparently healthy donors presumably with no history of previous or present infection with syphilis.

## SYPHILIS

- Donors with primary syphilis proved by darkfield examination, who had not received treatment.

- Patients having had primary syphilis proved by darkfield examination and who had adequate treatment with 2,400,000 units or more of penicillin not less than 2 nor more than 4 years prior to time blood was taken.

- Donors with secondary syphilis proved by darkfield examination, who had not been treated.

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• Patients with secondary syphilis proved by darkfield examination who had adequate treatment with 2,400,000 units or more of penicillin not less than 2 nor more than 4 years prior to time blood was taken.

• Donors with either latent or late syphilis, adequately treated with 4,800,000 units or more of penicillin.

#### WITH CONDITIONS OTHER THAN SYPHILIS

• Hospital patients with a variety of diseases or conditions, not receiving antibiotics and having no history of clinical evidence of syphilis; patients 12 years of age or younger with yaws; patients with pinta, below age at which associated syphilis might be expected; and leprosy patients not thought to have associated syphilis.

#### BIOLOGIC FALSE POSITIVES (BFP)

• Patients with reactive nontreponemal tests, at least one nonreactive (TPI) *Treponema pallidum* immobilization test, and no clinical evidence of syphilis.

• Patients with reactive nontreponemal tests, no previous TPI test, and no clinical evidence of syphilis.

#### Results

The results obtained with the three procedures on 592 serums from presumed nonsyphilitic persons are shown in table 1. Of the total number of serums tested, 329 were residuals of SERA study specimens which had not been previously heated or tested and had been stored in the frozen state in tightly sealed containers since the original date of collection and separation of the serum. The remaining 263 specimens were obtained from other sources and were added to the serum bank at later dates. Regardless of the origin of the serums, however, absolute agreement was obtained with the unheated serum reagin and the rapid plasma reagin test on unheated serum. Percentage reactivity was identical with all three tests (0.34 percent), although the two serums which reacted in the tests with unheated serum were not the same serums that were reactive in the VDRL slide test. The *Treponema pallidum* immobilization test, performed in this laboratory on these four specimens, was reactive in each instance, suggesting a treponemal infection, past or present.

Table 2 lists the results obtained in six clinical

Table 1. Results with 592 serums from presumed nonsyphilitic persons

Test	Nonreactive		Reactive <sup>1</sup>		Total	
	Number	Percent	Number	Percent	Number	Percent
Unheated serum reagin.....	590	99.66	2	0.34	592	100
Rapid plasma reagin on unheated serum.....	590	99.66	2	.34	592	100
VDRL slide.....	590	99.66	2	.34	592	100

<sup>1</sup> Reactive plus weakly reactive.

Table 2. Reactivity rate <sup>1</sup> in six clinically defined categories of syphilis

Category	Number of specimens	USR test		RPR-US test		VDRL slide test	
		Number	Percent	Number	Percent	Number	Percent
Primary, untreated.....	119	85	71.4	86	72.3	79	66.4
Primary, treated.....	29	4	13.8	4	13.8	0	0
Secondary, untreated.....	98	98	100.0	98	100.0	98	100.0
Secondary, treated.....	18	8	44.4	8	44.4	5	27.8
Latent, treated.....	25	23	92.0	23	92.0	17	68.0
Late, treated.....	203	190	93.6	191	94.1	178	87.7

<sup>1</sup> Reactive plus weakly reactive.

Table 3. Reactivity rate<sup>1</sup> in conditions or diseases other than syphilis

Category	Number of specimens	USR test		RPR-US test		VDRL slide test	
		Number	Percent	Number	Percent	Number	Percent
Conditions other than syphilis.....	73	7	9.6	7	9.6	4	5.5
Biologic false positive, nonreactive TPI test.....	111	53	47.7	53	47.7	54	48.6
Biologic false positive, no TPI test.....	109	55	50.5	55	50.5	48	44.0

<sup>1</sup> Reactive plus weakly reactive.

cally defined syphilis categories. Little difference was noted in the reactivity rate of the two tests on unheated serum although the RPR test appeared to be slightly more reactive than the procedure using measured amounts of reagents. Both tests were more reactive than the VDRL slide test in all categories except untreated secondary syphilis. In adequately treated primary, secondary, and latent syphilis, the lower reactivity rate of the VDRL slide test was most apparent, suggesting a more rapid reversion to nonreactivity after treatment.

Findings with the three procedures in conditions or diseases other than syphilis are summarized in table 3. With conditions other than syphilis the incidence of reactivity with the two tests on unheated serum was approximately twice that of the VDRL slide test. Results obtained with all three tests were approximately the same in one biologic false positive category, composed of serums from persons who had been screened with at least one nonreactive TPI test. None of the patients in the second BFP category had been previously tested with the TPI. In this group, the VDRL slide test was less reactive than the two procedures performed on unheated serum.

### Summary and Conclusions

The comparative results obtained with the unheated serum reagin test, the rapid plasma reagin test on unheated serum, and the VDRL slide test on serums from medically defined patient categories are presented.

1. No significant differences were observed between the two tests on unheated serum.

2. Percentage reactivity was the same with all three procedures in the group of healthy, presumably nonsyphilitic persons.

3. In serums from donors with syphilis, the two procedures with unheated serum were more reactive than the VDRL slide test in all categories except secondary, untreated, including those patient groups who had received adequate treatment.

4. The unheated serum reagin test and the rapid plasma reagin test on unheated serum were almost twice as reactive as the VDRL slide test in the category of patients with diseases other than syphilis.

5. The results obtained with the three procedures were quite similar in the two groups of patients classified as biologic false positive reactors.

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**APHA**

*Conference  
Report*

**SUMMARIES OF SELECTED PAPERS  
from the 87th annual meeting  
of the  
AMERICAN PUBLIC HEALTH ASSOCIATION  
and related organizations  
held at Atlantic City, N.J.  
October 19-23, 1959**

# THE CONFERENCE REPORT

With the assistance and cooperation of the authors, the staff of *Public Health Reports* has summarized roughly four-score papers presented at the 87th annual meeting of the American Public Health Association and related organizations, in Atlantic City, October 19-23, 1959.

The objectives of this annual summation are to touch bases for the members of the conference who found it physically impossible to make the rounds of every meeting in which they were interested; to present in a single package many of the major topics presented at the conference; to permit those unable to attend the conference to obtain a wide-screen view of developments in public health work; and to provide authors of papers with an opportunity to reach a broad professional audience, with at least a summary of their information, in anticipation of the usual course of publication.

This summation has been a bit more eclectic than usual. As the American Public Health Association plans to publish in three separate supplements to its journal papers presented by foreign guests of the conference, papers on heart disease, and papers dealing with behavioral sciences, few if any of those papers are represented here.

Certain other papers were passed by because they did not lend themselves to treatment in this collection, or because they are now in print in full. Many interesting talks given at the conference are not carried here because the authors either spoke without reference to a text or did not provide copy for *Public Health Reports*.

This summation is prepared at the invitation of the American Public Health Association. For further details on the papers touched upon, readers are advised to communicate with the authors. Many of the papers presented to the conference, whether or not they are mentioned here, remain under consideration for full publication in professional journals in the near future.

The next annual conference is scheduled for October 31 to November 4, 1960, in San Francisco.

# Public Health Trends . . .

## Mene Mene Tekel Ufarsin Decoded

A willingness to meet the inevitable halfway was recommended by Elton D. Woolpert, assistant to the Surgeon General, Public Health Service, as the appropriate response to changes portended by the modern handwriting on the wall which he discerned in statistics of social trends.

Predicting a high rate of obsolescence of plans to meet the future, he advocated anticipating imminent changes with new methods, well tested and thoroughly developed by public health research and demonstration. The alternative he left to the imagination.

Among emerging stresses which are on the point of producing intolerable social strains, he mentioned the following:

**Personnel needs:** The demand for physicians alone, he asserted, calls for founding at least one new medical school a year for the next 15 or 20 years, if only to keep the present proportion of medical services.

**Facilities:** The number of beds and other accommodations needed to provide for the aged and chronically ill is not keeping pace with the increase of the aged population.

**Government:** Local governmental structures of the past are ill-suited to the management of urban complexes, with their interrelated systems of recreation, education, medical care, transportation, water supply, and waste disposal.

**Services:** Present jurisdictional lines are ill-suited to administering related public services. What is needed is "not so much new boxes on the organization charts" as new patterns of services meaningful to the public.

**Taxation:** Dependence on property taxes, inadequate assessment of real property taxes, and rigid tax and debt limit are serious obstacles to adjustment of public service and construction programs to meet needs of a growing population in a period of rising prices.

**Urban representation:** With State legislatures elected to serve a population pattern of 1900, rather than the dominantly urban pattern of the present, municipal officials, hampered also by limits on powers to tax or incur debt, are obliged to seek direct assistance from the Federal Government for community services.

**Research:** Public health administration, facing new challenges with the encumbrance of archaic and impoverished institutions and methods, lags notably in obtaining studies which will appraise its needs and which may devise methods of adjusting present facilities or creating new approaches.

In conclusion, Woolpert observed that his efforts at translating the handwriting on the wall were by no means complete, that others for years to come will have the pleasure of continuing in that occupation.

## Private Physicians Aid City Services

Foreign visitors to the APHA conference, so accustomed to governmental management of health services that they can hardly conceive of private support of public health facilities, went through a mental earthquake as they heard a description by Dr. Harry S. Lichtman and Simon Podair of the work of the public health committee of the medical society of the County of Kings, New York City. Dr. Lichtman is chairman of the committee.

Members of the committee include general practitioners and many specialists, including the authors of the report, both employed by the New York City Department of Health. Lichtman is borough chief of Brooklyn in the bureau of preventable diseases, and Podair is coordinator of health education for the borough. Nonmedical specialists are invited to sit with the committee as consultants.

In 1956, the committee threw its full resources into a drive for Salk vaccine inoculations against poliomyelitis in parochial schools and

child care centers. This program broadened into a drive for mass immunization of adults, which entailed free services by members of the medical society, using vaccine contributed by tax-supported agencies.

A second effort of the committee has been directed at enlisting the efforts of private physicians in improving public knowledge and attitudes toward questions of health, through private conversations with patients. The committee supplies physicians with information on developments in health matters of public interest and encourages physicians to supply patients with effective answers to quackery, sensationalism, superstition, and misinformation.

One device for encouraging the transmission of such information has been a series of public forums called "Twelve Wednesdays for Your Health." Although only 400 are seated in the lecture hall where the issues are discussed, the program is publicized to 15,000 members of the institute, and the proceedings are reported in the New York press.

Voluntary associations collaborate in these forums, to the extent they are directly concerned. They put up exhibits, supply literature, and offer information on the spot.

Some of the lectures given at these meetings have been published in the *New York State Journal of Medicine*, although they were prepared originally for information to a lay audience.

The success with the forums led to a radio program for a local audience, which has since been transcribed and broadcast by the Voice of America. The series of radio interviews has been taped and rebroadcast by the station, WEVD.

Because of controversies on public health procedures, initiated by cultists, the committee arranged with newspaper publishers to prepare answers to attacks on fluoridation, poliomyelitis immunization, and other public health programs. It has also prepared a weekly health column for publication in the Brooklyn press.

A speakers' bureau was organized by the committee in response to a great demand for qualified speak-

ers from parent-teacher associations, churches, centers for the aged, settlement houses, and other institutions. A panel was organized by the committee from members of the medical society. Names are forwarded when requests are made by either community organizations or the health department. The services of the speaker are reported in the bulletin of the medical society.

A subcommittee on mental health has been organized. One of its prime objectives is to improve the psychiatric training of the non-psychiatric physician. In cooperation with the Kings County chapter of the American Academy of General Practice, seminars are conducted under direction of one psychiatrist, with six to eight participating physicians. The method has been so well received that several hospitals are experimenting with it for postgraduate training. In December 1959 the U.S. Public Health Service gave the subcommittee on mental health a grant of \$51,840 for 3 years, for the education of the nonpsychiatric physician.

Periodic physical examinations of physicians were organized by the committee, utilizing facilities of four civic health centers in Brooklyn. More than 200 physicians have been examined.

A recommendation of the committee, urging footprints of infants and fingerprints of mothers for purposes of identification, has become a requirement of the New York City Health Code.

A directory of medical and social services which physicians may use in counseling patients is the latest project of the committee.

The committee has also prepared and released more than 12 reports on issues of public health significance, such as employment of hospital epidemiologists.

## Land Competition Becomes Planned

The ancient competition for land, once a simple preoccupation of militant farmers, hunters, trappers, cat-

tlemen, sheepherders, miners, merchants, and robber barons, has become refined. As described by B. Budd Chavooshian, chief of the New Jersey State Planning Bureau, the hurlyburly of the battlefield has settled down to a spell of fretting at the drawing board, murmuring at conference tables, and activity at the polls.

Land uses for each individual, neighborhood, and business have become so complex and interrelated that internal conflicts, according to Chavooshian, have virtually imposed upon entire regions demands for planned land use which frequently become issues for political action.

Planning for land use, as he describes it, consists of preparing reports, maps, and charts describing present and prospective uses of land in relation to needs; designing effective means for moving freight and passengers; and assuring space for recreation, educational facilities, and public utilities.

Private interests in land use are classified by planners into residential, commercial, and industrial users, each with special requirements as to location and facilities. He recommended also that land-use plans pay regard also to the conversion of land for agriculture, in view of the fact that builders of roads, housing, industrial plants, and other urban facilities are gobbling up 3,000 additional acres of open land every day.

Instruments of executing land plans mentioned by Chavooshian, apart from such traditional means as credit, include zoning and building regulations, ordinances regulating subdivisions, and urban renewal programs supported by Federal funds.

As examples of communities which have serious planning programs underway, Chavooshian briefly mentioned Toronto, Canada, Dade County (Miami), Detroit, and the Twin Cities of Minnesota, Minneapolis and St. Paul.

The State Planning Bureau in New Jersey, he said, is one of the few agencies to set up planning services for a long list of communities. Mas-

ter plans for 60 of 120 communities receiving these services have been completed with regard to needs of adjacent areas, and plans for 15 others were nearly completed last fall. Over 40 additional municipalities have applied for similar planning assistance. This program is undertaken under the provisions of section 701 of the Federal Housing Act of 1954, as amended. The agency also has an urban renewal survey underway in 278 municipalities comprising 9 counties in the northeastern portion of the State. This survey is financed in part by the Federal Government under the provisions of section 314 of the Housing Act of 1954.

In meeting the problem of land development, the bureau has also initiated a broad base State planning program, including capital improvements programming.

## The Doctor's Dilemma: Panic or Prevention

As one more piece of historical evidence, the case of the fresh flounder tainted with sodium nitrite was reported by Dr. Morris A. Shiffman, Dr. Milton Werrin, and Dr. Sylvan Fish, of the Philadelphia Department of Health, to illustrate the delicate task of a health department in protecting the public without wreaking havoc. The authors are chiefs, respectively, of milk and food, veterinary public health, and communicable disease sections of the department.

The flounder outbreak struck shortly before Good Friday last year. With one child dead from sodium nitrite poisoning, the department took emergency measures to detect the source, alert the public, and recall shipments which might have affected as many as 4,000 persons. The preventive action was on the whole successful. At the same time, hundreds sought medical aid unnecessarily; unknown quantities of harmless fish were discarded; and sales of seafood in Philadelphia, dropping immediately to 10 percent

of normal, did not recover completely for several months.

Within 20 hours after receiving the first word that a family had suffered food poisoning, originally thought to be botulism, the Philadelphia Health Department, the New Jersey State Health Department, the New Jersey State Police, and the Food and Drug Administration had determined that an unknown quantity of flounder containing sodium nitrite had been distributed in the area. The time was shortly before the dinner hour, barely enough to meet the 5 o'clock deadline of the evening papers.

Under the circumstances, say the authors of the report, there was no time for preparing "a carefully worded press release." Newspapers and radio stations were notified orally by the press officer of the department. That night, one headline read, POISON FISH FLOODS AREA. TV and radio programs were interrupted to issue warnings which were repeated at 15-minute intervals. Later, these media announced antidotes, recommended by the Philadelphia Health Department for those who experienced symptoms of poisoning following a meal of flounder.

Meanwhile, the source of contaminated flounder had been identified. Police on foot and in radio cars carried warnings to all possible distributors. In suburban and rural areas, police broadcast warnings by loudspeaker. They also put out an announcement on a 14-State teletype network, reaching well outside the market area, to the distress of adjacent distributors of seafood.

The public response may be judged by the fact that the municipal switchboard handled 20,000 calls on the night of the alert. Additional thousands of calls were directed to hospitals and physicians. At the health department office, these calls were answered by reading of a prepared statement by operators who stayed on duty far beyond the normal working period.

Reflecting on these events, the authors are uncertain that the an-

nouncement could have been issued with a greater degree of discretion. The nature of the news itself, they feel, more or less determined its treatment and the public response.

Although Philadelphia Health Department officials are in 24-hour contact with the municipal radio dispatcher for emergency calls, and although the department has a poison control center operating 24 hours a day, the officials feel it might be desirable to have a 24-hour emergency service in the department, with one trained person on hand at all times to issue information and direct emergency actions.

### State Consultation Raises Hospital Standards

A hospital consultation program in a State health department can provide many varied services to hospitals and help assure the best possible quality of patient care, according to Dr. Goldie B. Corneliussen, director of the maternal and child health division, and Dr. Fanny H. Kenyon, chief of the hospital consultation and licensing section, Michigan Department of Health.

Such a program, they pointed out, requires teamwork of the highest order, and mature personnel who will learn as well as teach. Consultation services are usually given by a relatively small team assigned full time to the hospital program, supplemented, as needed, by specialists such as epidemiologists, pediatricians, and obstetricians, laboratory scientists, dietitians, ventilation and radiological engineers, and statisticians, whose responsibilities include but are not limited to service to hospitals.

The Michigan consultation team is directed by a physician, and includes four nursing consultants, two part-time sanitary engineers, and two clerks. Corneliussen and Kenyon stressed the importance of medical direction of the program, pointing out that a physician-director, preferably one with experience in private practice as well as public

health, has both understanding of patient care and hospital problems and status with hospital administrators and staff. All the Michigan nursing consultants have had hospital supervisory experience and each has a master's degree in a different nursing specialty.

Michigan gives consultation to more than 260 hospitals and also to State mental hospitals and tuberculosis sanatoriums. Consultation is provided on such diverse matters as layouts of nurseries, maternity departments and kitchens, problems of central supply ventilation, help in developing obstetrical policies, educational programs, record forms, and the establishment of procedures and routines for brand new hospitals.

Aid is given also in emergencies. In cases of infection in a hospital, the department's epidemiologist heads the study team and has top priority on services of nursing consultants and sanitary engineers. When the infection is in a newborn nursery, the nursing consultant dons her uniform and often spends several days observing techniques on all shifts.

### Licensing Responsibilities

In 1951, the responsibility for licensing hospitals with maternity departments was transferred to the Michigan Health Department from the Department of Welfare. The consultation staff was somewhat fearful, according to Corneliussen and Kenyon, that the new licensing operation might interfere with the excellent relationships it had established with hospitals. Instead, the licensing function has seemed to strengthen the consultation program and the department's years of experience with consultation have helped to play down the "policing from above" too often inherent in licensing programs, they reported.

With the assistance of hospital administrators, physicians, and nurses, the State developed higher hospital standards than it had originally thought feasible, Corneliussen and Kenyon stated. Only hospitals



approved and certified by the State health commissioner are eligible to receive payment for the care of public assistance recipients from Federal, State, and local funds.

Hospitals were given a reasonable time to comply with the regulations, with the health department providing advice and consultation on methods of meeting the requirements efficiently, economically, and practically.

Michigan's "Rules and Minimum Standards for Hospitals" now include 180 individual regulations, divided into three categories: those requiring immediate compliance, those requiring planned compliance, and a third group of undesignated rules which are to be placed in the immediate and planned categories at dates considered reasonable for the majority of hospitals.

In 1951, the first year of licensing, hospitals had only four so-called immediate compliance rules to meet in order to qualify for full licenses, yet only 56 percent were able to qualify. By 1959, with the immediate compliance list including 124 of the 180 rules, 90 percent of Michigan's hospitals qualified for full licenses.

The Michigan experience, Corneliussen and Kenyon said, has taught the State health department that:

Leaders among hospital administrators, practicing physicians, and nurses are eager to work with a governmental agency in development of standards which will be administered by the agency. Having shared in setting standards, they become the best interpreters of them.

It is more satisfying to the hospital and the health department when a hospital improves its practices or facilities as a result of good consultation or education rather than because of big stick action.

## Community Mental Health Management Reviewed

To generate understanding of mental health in a community, professional personnel may well have a long, hard road to follow, Dr.

Arthur J. Bindman and Dr. Lewis B. Klebanoff of the Massachusetts Department of Mental Health said, reporting on administrative problems inherent in establishing a community mental health program.

Although mental health is considered a virtuous and worthy cause, many varied attitudes are encountered. These attitudes must be understood and evaluated before professional personnel can work effectively for mental health in any locale, the authors stated. Goals cited for community leaders were the ability to see beyond individual interest in demands for service and to accept the limitations set by staff and budgetary boundaries.

Massachusetts was a pioneer, according to the authors, in establishing a mental health program based on local-State sponsorship of permanent mental health centers. This approach replaced traveling child guidance and school clinics, operating part-time on the local scene.

Community understanding, they said, may be encouraged by planned efforts in general mental health education, knowledge of the variety of services offered by a community mental health center, and promotion of support, both moral and financial. The authors urged emphasis on the partnership aspects of local and State participation and the use of the indirect approach in community organization.

A community mental health center, the authors suggested, can benefit from a clear pattern of communication and coordination between local and State departments; community acceptance through representation on advisory groups of organizations concerned with mental health; adequate financing; inservice training, standards, and salaries; and active relationships with schools and other caretaking agencies.

### New Jersey

The role of the local health department in mental health, as explored in a 2-day workshop conducted by State and local agencies in New Jersey, was reported by two

participants, Dr. Jesse B. Aronson, director of the division of local health services, State Department of Health, and Dr. V. Terrell Davis, director of the division of mental health and hospitals, State Department of Institutions and Agencies.

The workshop, requested by a group of New Jersey health officers, opened the door to active local health department participation in programs of prevention and control. The authors said all participants stressed the need for wider use of available services, either in modified or expanded form, in any attack on mental illness in the community.

In general, there has been a tendency to consider mental illness as separate and apart from other diseases, the authors observed, with the following results: Local health departments have not considered mental health a primary public responsibility. Popular understanding of mental illness is delayed. Existing community facilities are not used as effectively as desirable, and in fact are duplicated in some instances at additional cost to the taxpayer. And treatment services are emphasized rather than preventive measures.

The health officer, because of his accepted position in the community structure, can perform the urgently needed function of coordinating independent community mental health services with existing community services for the prevention and control of other diseases, the authors concluded.

## Radiation Safety: The Inside Story

The significance of the ingestion of radioactive materials in the light of man's total exposure to ionizing radiation was discussed by James G. Terrill, Jr., assistant chief, Division of Radiological Health, Public Health Service.

Human exposure to the external and internal hazards of ionizing radiation results in somatic and genetic damage which may or may not be immediately apparent.

In order to judge the significance of radiation hazards and the control measures that are necessary, Terrill stressed the importance of the overall identification of sources and evaluation of exposures.

The cumulative effects of ionizing radiation are influenced by the half-life of the source and the nature of its emissions. Terrill indicated that other factors are involved including the total effects of a combination of internal emitters; the tendency of certain emitters to concentrate in specific tissues, organs, or locations; variability of effects with age; the question of linear versus threshold dose-effect relationships; and the uncertainty as to the distribution and movement of radionuclides through the environment, and through the human body.

With the increasing concern over the exposure of the general population to ingested radioactive material, Terrill noted that the need for radiation health standards applicable to this group is becoming more acute. The terminology of "maximum permissible concentrations," while applicable to occupational exposure, presents many difficulties in interpretation of the health significance of the levels of a mixture of fallout and reactor effluent which will be measured by the public health agencies.

Terrill stated that the question of standards for the general population was considered during the 1959 fallout hearings held before the Joint Committee on Atomic Energy—the conclusion being that "standards do not (and cannot) set a line which is 'safe' on one side and 'dangerous' on the other." In all exposures to ionizing radiation, he emphasized, there is a calculated risk.

Another difficulty he mentioned is the issue of deciding whether the standards should apply to population averages, to peak values for individuals as they do in occupational exposures, to individual materials, or to average diets.

Such issues, he concluded, explain the need for developing data on effects of radiation, methods of meas-

urement, and total exposure as a guide to practical methods of control which may contain the risk with assurance and yet permit useful and beneficial applications of nuclear science.

## Women Employees Affect Absenteeism Rates

Industry absentee rates and the shifting occupational distribution of women were discussed by Evelyn S. Spiro, labor economist with the Woman's Bureau, U.S. Department of Labor, in a review of the health and safety of working women.

The number of women workers in the Nation, more than 22½ million, may grow to some 32 million by 1975, predicted Spiro. Now they represent a third of the total work force, two-thirds of the clerical and more than half of the service workers, and almost all of the domestics. Although the professional and technical group has been growing at the most rapid rate, its proportion of women has declined. She believes that in the 1960's durable goods manufacturing will employ substantially more workers and the textile, tobacco, and leather industries, fewer. Among the women workers themselves, about a third are clerks.

Absenteeism data, though still fragmentary, in the opinion of Spiro, shows that time lost for job injuries is generally less for women than for men, but that women's frequency of nonoccupational disabilities is higher. The most days are lost for disability by the lowest income group. In a nationwide study of sickness absences of 5 consecutive weeks in cooperating establishments, frequency and duration rates increased by age for both sexes. The frequency rate for women was four-fifths higher than for men, with differences greatest in the 25- to 35-year age bracket. Among women, frequency was generally higher in manufacturing, in nondurables output, and among production workers rather than salaried. The average duration of these prolonged ab-

sences was 10½ weeks for women, about 2 days less than for men.

Spiro referred to a company study in which most sickness absenteeism was found to be among a few employees who were more discontented and prone to nervous and emotional disorders than others. Women averaged twice as many absences as men but of half the duration.

Fewer accidents occur in occupations and industries employing many women, said Spiro, except for some, such as poultry packing and certain other types of food processing, and in laundries and retail food stores. The average injury severity rate in 1956 and 1957 for apparel workers, mostly women, is the lowest in manufacturing.

In work such as canning and preserving, Spiro thinks that a high frequency of injury may be due partly to seasonal, short-term operations employing casual or inexperienced workers for long hours and deferring of repairs to the end of the rush season.

Attendants and food service workers were among those having the poorest safety records among hospital employees, who seem occupationally disposed to trunk injuries. Tuberculosis, viral infections, and skin disorders were the most common occupational diseases among hospital workers.

## Men Report Less Illness Die Earlier than Women

That men run greater risk of life-endangering illness than women is suggested in a study reported by Dr. Lawrence E. Hinkle, Jr., associate professor of clinical medicine, Cornell University Medical College, New York City. Women may appear to have more illness, he said, because they report more minor illness than men do.

The study, in which Ruth Redmont, Norman Plummer, and Harold G. Wolff collaborated, was a project of the New York Hospital-Cornell Medical Center, covering disabling illness among 116 men and

96 women, New York Telephone Company employees, comparable in environment and other pertinent aspects, retrospectively for 20 years, and progressively for 5.

For both groups, the most frequent episodes concerned the respiratory and gastrointestinal tracts, muscular system, skin, eyes, and teeth. Men had a higher rate than women of such illnesses as pneumococcal pneumonia, pulmonary tuberculosis, and heart disease, bringing their death

risk rate to a ratio of 4 to 3 for women.

More frequent illness episodes for women than for men may stem from culturally determined differences in attitude toward acceptable disability for the man and the woman, said Hinkle, conjecturing that, rather than being "unhealthy," women were more easily incapacitated but harder. Further studies should "resolve the apparent paradox that mortality is inversely proportional to morbidity," he concluded.

serve University School of Medicine, Cleveland, Ohio.

He listed the following criteria to be met before any virus is incorporated into such a polyvalent vaccine used to immunize widely:

1. A clear demonstration that the virus causes the disease in question.
2. The disease is followed by immunity.
3. The virus can be grown in sufficient quantity to prepare a vaccine that effectively stimulates antibody.
4. A positive correlation exists between the presence of antibodies and resistance to infection.
5. Incidence of illness caused by the virus is great enough to warrant immunization on a broad scale.

Only the adenoviruses producing acute respiratory disease in military populations meet these criteria at present, he stated.

The acute minor respiratory infections with unknown causes constitute the bulk numerically of respiratory illnesses, Dingle said.

Of the 70 new viruses discovered in man in the past decade, nearly half were in the respiratory tract. Some have been identified as the cause of respiratory illnesses, some are associated with respiratory illnesses and also are present in apparently healthy persons, some appear to persist as latent agents in sites such as the tonsils and adenoids and play a minor role as provoking agents of disease, and others, seemingly unrelated to illnesses, have been termed "viruses in search of a disease."

At present, 18 types of adenoviruses have been isolated and more probably exist. The syndrome of acute respiratory disease in military recruits is caused principally by types 4, 7, and 14, and, to a lesser extent, by type 3. Aside from the outbreaks in summer camps and children's institutions characterized by pharyngitis, demonstrated to be caused by type 3, the importance of adenoviruses in causing disease in the civilian population is still uncertain, according to Dingle.

He described three new viruses, the parainfluenza viruses, in the

## The Viral Diseases . . .

### Live Polio Vaccine Spreads Lightly

An experiment to test the communication of live poliomyelitis vaccine, undertaken in two Louisiana communities in June 1959, was the subject of a preliminary report by Dr. Henry Gelfand, virologist, Public Health Service; Louis Potash, virologist, Merck, Sharp and Dohme; and Dr. John P. Fox, professor of epidemiology, Dorothy R. LeBlanc, and Dorothy I. Clemmer, instructors in epidemiology, Tulane University Medical School.

A surprising finding was that, under apparently ideal conditions, the virus spread from vaccinated children to unvaccinated children only to a limited degree. Instead of "an explosion of transmission," the virus was isolated from only 58 percent of contact families, from 39 percent of susceptible contact children, and from 19 percent of immune contact children.

Moreover, many of the contacts excreted virus for so brief a period that they could hardly have served as effective sources for its spread, Gelfand said. He added that such infections may have failed to stimulate either antibody or local intestinal resistance.

At the same time, 90 percent of the children fed live vaccine orally excreted homologous virus, indica-

ting the achievement of some immunity. Vaccine strains of all three types were provided by Dr. Albert Sabin from pools that had fulfilled his criteria for purity and attenuation. Because of the specific status of immunity in the communities studied, only type 3 was used.

No illness was observed to result from any of the infections.

In his discussion of the results, Gelfand observed that if these findings are confirmed by future experience, "concern with possible enhancement of the pathogenicity of the vaccine virus during human passage may be minimized." At the same time, he saw little hope of conferring immunity to an entire population by the seeding of only a part.

The failure of the vaccine strain to infect a larger proportion of the contact children he attributed in part to relatively low infectiousness of the vaccine strain, as compared with "wild" viruses, and in lesser degree to viral interference.

### Polyvalent Vaccine Standards Stiff

A vaccine containing all known agents associated with acute minor respiratory diseases is neither practical nor scientific at present, declared Dr. John H. Dingle, professor of preventive medicine, Western Re-

myxovirus group. Parainfluenza 1 virus was isolated in Sendai, Japan, from newborn infants suffering from viral pneumonitis; parainfluenza 2, from patients diagnosed as having croup.

Almost all adults have antibodies to parainfluenza 3, formerly known as hemadsorption virus type 1, but whether this virus produces clinical or subclinical infection has not been determined with certainty.

Among other viruses isolated are the chimpanzee coryza agent (CCA), found in certain cases of pneumonitis in infants and children, and the closely related 2060 and JH viruses, which are associated with mild respiratory illnesses.

Dingle concluded that knowledge of the causes of acute minor respiratory diseases is expanding and some semblance of order is emerging, although all the agents isolated account for only a relatively small proportion of the acute minor respiratory infections. He was confident that an important breakthrough has been made, and that the cause of the common cold, which occurs most frequently of all respiratory infections, will be found.

## Mild Ills Offer Virus Clues

A mild febrile illness among families at the Great Lakes Naval Training Center in the summer of 1958 was investigated by Dr. Alfred D. Heggie, Dr. Irwin Schultz, Dr. Richard Gutekunst, Max Rosenbaum, and Dr. Lloyd F. Miller, attached to Naval Medical Research Unit No. 4.

Roughly a third of the families were affected by illness characterized by an upper respiratory infection and with associated gastrointestinal disturbances, enduring about 5 days, on the average. Fever and sore throat were the most frequent complaints. About a third of the patients reported headache and diarrhea. In a fifth of the patients, chest pains of a pleuritic nature were experienced.

The team found a "highly signifi-

cant association of the occurrence of illness with the isolation of virus from throat and rectal swabs" and attributed the outbreak to infection with Cocksackie B2 virus.

Viral isolation was about the same in all children under 12 years of age in the community, but there was significantly less illness in those of the group above age 6. Both illness and isolation rates were relatively low among adults. The team suggested that previous experience with the virus in the older children and adults may have modified response to the virus.

Although none of the more serious illnesses associated with Cocksackie viruses were found, the team suggested that studies of outbreaks of nonspecific febrile illnesses may aid understanding of the communication of Cocksackie infections and their control.

## Bird Fever Distribution Thwarts Epidemiology

The virus which produces psittacosis is so widely distributed and so infrequently destructive to a human host that it presents special difficulties for the epidemiologist, some of which were described by Dr. Rex E. Graber, district health officer in Wisconsin.

Following a 4-year study of employees in a turkey processing plant, he found that "a practical means of preventing infected birds from reaching the processing line is not apparent." Infections in birds, as well as in humans, are usually subclinical, he added, and there is no practical diagnostic method for screening carriers. "Serological study and virus isolation, at their best, are slow, tedious, expensive, not easily available, and not sufficiently sensitive," he said.

At the same time, he recalled that Texas studies failed to yield evidence that there was a health hazard from cooking or consuming turkeys which came from farms known to have harbored infective strains of high virulence and toxicity. That assurance was issued in 1954. Con-

sequently, he felt that there was little hazard to consumers of turkeys from territories such as Wisconsin and Minnesota where the virulence of the strain is mild.

"Until control of the disease in the birds due to all strains is achieved," he said, "the first line of defense against the human hazard, in present day practice, must depend upon prompt recognition and treatment after the disease has been transmitted."

Usually, in Wisconsin, he said, physicians administer antibiotics early to patients acutely ill with symptoms and signs of respiratory infections. Such medication is effective against only a few of the primary causes of such symptoms, he added, but the physician also hopes by such treatment to prevent secondary infection. Tetracycline preparations have been found to be effective against the virus, but they also have the effect of preventing the production of detectable antibodies, with the consequent sacrifice of the opportunity of diagnosing the infectious agent.

Undoubtedly, he said, many sporadic cases of psittacosis from whatever source escape identification, and the number that might be associated with poultry is highly conjectural. Nevertheless, he believes there will remain ample opportunities for investigating this disease wherever birds are raised and processed in large numbers, unless by unforeseen methods the disease becomes controlled.

## Need Way to Screen Rabies Immunity

Demonstrations of effective immunization against rabies still leave unanswered the question of identifying those who do not respond, according to Dr. R. L. Hectorne, veterinarian, Kentucky Health Department, and Dr. F. B. Peck, Jr., research associate, Eli Lilly and Company.

Using duck embryo for primary immunization, they determined that neutralizing antibody developed in a

majority of the subjects tested. Following the original 14-dose course, they found that only one or two booster shots seem necessary, once basic immunization has been established.

However, because of the few who fail to respond to immunization techniques, the authors refrain from offering a blanket recommendation for primary prophylaxis for rabies. Research is needed, they said, on a screening method to determine when immunization has been achieved.

### *Serum Sickness a Factor*

When a patient develops serum sickness which is treated by corticosteroids in the course of administration of antirabies serum and vaccine, immunization may be defeated, in the opinion of Dr. Dorothy T. Magallon, on leave from the Kentucky State Health Department.

She had observed the usual incidence of serum sickness, about 20 percent, in 41 patients treated following bites by suspected rabid animals. In a group of 32 patients

given antihistamines with the serum and vaccine, one developed serum sickness. Blood studies on these patients suggested that antihistamines might be used to offset serum sickness without interfering with antibody levels. However, antibody studies on the patient who developed serum sickness and received corticosteroids showed a total lack of response to vaccine. This suggests that patients who develop serum sickness may be exposed unwillingly to the hazards of both serum and vaccine without acquiring protection against rabies, although further research is needed to confirm this premise and to define more clearly the place for antiserum in rabies prophylaxis.

The best insurance against rabies or complications of antirabies therapy, however, she said, is the discerning physician who will weigh the risk of treatment against the probability of infection, considering circumstances of exposure, extent and location of the wound, behavior of the animal, and prevalence of rabies in the community.

kets are brought into the operating room, that no street clothes or ordinary hospital uniforms be worn under gowns, and that no one enter or leave the room during an operation.

In the Middlesbrough public health laboratory, ventilation methods are being tested in a full-sized dummy operating room. Inflow of contaminated air has been prevented through the use of ports with weighted flap valves. When a door is opened and pressure in the room drops, these valves close and make the entire air supply available to give a strong outward draft through the door.

Blowers found that organisms inside the uniformly contaminated dummy room, where contamination arises below the table, are removed more rapidly by the downward displacement or "piston" method of ventilation than by other methods. This is effected by introducing clean air at the top of the room so that there is a minimum of mixing with the contaminated air which is removed by downward displacement. Also, fewer organisms are deposited on an exposed culture plate which represents the wound.

For an operating room, the best method of ventilation depends on exactly where organisms are discharged into the air. It is known, Blowers said, that few *S. aureus* are shed from the respiratory tract of nose and throat carriers and that many are shed from the skin and clothing of general skin and perineal carriers. What remains to be discovered, he suggested, is whether surgeons and nurses shed their *S. aureus* above or below the waist during their activities in the operating room.

### **Air Samples Measure Staph Contamination**

The need for quantitative as well as qualitative analysis in studying the relation of the environment to hospital-acquired staphylococcal disease was stressed by Lawrence B.

## Staphylococcus Control . . .

### **Operating Room Bacteria Controlled by Ventilation**

Airborne infection of wounds during surgical operation is an appreciable hazard, declared Dr. Robert Blowers, director of the public health laboratory, General Hospital, Middlesbrough, England.

Reporting the results of air sampling during operations and sepsis records associated with them, Blowers said that when general bacterial counts were between 20 to 40 contaminated particles per cubic foot, the *Staphylococcus aureus* sedimentation rate was about 0.5 particles per square foot per minute. In operating rooms where efforts had been

made to reduce airborne contamination, general bacterial counts were as low as between 1 and 2 particles per cubic foot, with the *S. aureus* sedimentation rate roughly 0.005 per square foot per minute, thereby reducing considerably the occurrence of sepsis.

However, Blowers pointed out, because it is still unknown whether the sepsis that does occur is airborne, more observations must be made before bacteriological standards of safety can be defined.

Bacteria in the air can be reduced effectively only when a good ventilation plant is combined with operating room discipline, he said.

Blowers suggested that the surgeon insist that no unsterilized blan-

Hall, chief of the Equipment Development Section, Communicable Disease Center, and Herbert M. Decker, chief of the Protection Branch, Ft. Detrick.

Many improvements have been made in sampling techniques, particularly in air sampling. The techniques should be used wherever possible, they said, in order to learn the extent of contamination.

Hospitals are usually concerned with the contamination of fomites. Although it is possible to estimate the quantity of contamination of a fomite, as well as its character, Hall and Decker cautioned that the quantitation is only relative, and the limitations of the procedures must be kept in mind.

The contamination of fomites is roughly similar to that of air and the degree of activity in the vicinity since the organisms on the fomites are readily resuspended in the air. To measure this route of transmission as well as droplet nuclei and similar particles moving directly from the host into the atmosphere, the contamination of the air can be sampled by a number of devices, some with only qualitative, some with quantitative characteristics.

Impaction-type samplers, although limited to the collection of bacteria, the authors said, are best suited to the demands of hospital use. For both bacteria and viruses, a liquid impinger can be used.

Hall and Decker described the various types of impaction-type samplers available, their operating characteristics, and their limitations.

They pointed out that the liquid impingers, the sieve, and the Andersen samplers provide both qualitative and quantitative information concerning airborne organisms. The slit-type sampler, because of its mechanical simplicity, its lack of manipulation of the sample after collection, and its time-concentration relationship, is particularly suitable for hospital use when the air being examined is essentially static. Particular advantage, they said, should be taken of the time-concentration

relationship since this information can be of invaluable assistance in pinpointing a route of transmission and contributing to the epidemiology of the disease under study.

## Nursing Research Takes Bearings

For the nursing profession to participate in scientific investigation of the effectiveness of its practice, declared Margaret Thomas, nursing consultant, Epidemiological Branch, Communicable Disease Center, it must clearly delineate this practice and join with the medical profession and related fields in setting up suitable methods of study.

Because nurses' inquiries about aseptic techniques made apparent the need for more specific recommended procedures in the control of staphylococcal infections, a status survey was made of the practices used in the obstetric departments of 13 medical centers.

The objectives of the survey were to determine what aseptic procedures were being used and whether they were used consistently, whether there was a relationship between the diligence with which the nurse carried them out and the incidence of known infections in the hospital, whether any studies had been done in the institutions for determining procedures to be used or their effectiveness, and how well currently recommended standards were being met.

Although a critical analysis of the results of the survey has not been completed, Thomas cited some of the general impressions of the investigators.

- Nurses seemed eager for consultation and for someone to listen to their ideas. They were zealously striving to enforce what they believed to be protective procedures.

- All infections committees of the institutions had nursing representatives who were not only involved in establishing control measures, but in some instances were actively engaged in maintaining reporting systems.

- Hospital administrators ap-

peared anxious to protect their patients. The recognition of the importance of space and equipment in prevention and control of infections was evidenced by new construction and remodeling.

- On the negative side, the investigators found that the surveillance programs were not sufficiently organized to permit study of the relationship between incidence of infection and the adequacy of aseptic practices.

- The lack of knowledge of scientific principles was obvious. There were few instances of original scientific study as a basis for establishing aseptic practices. Most of the existing studies were in housekeeping departments and were mainly concerned with blankets and detergent sanitizers.

- There was an apparent lack of concern about time-temperature relationship in heat sterilization and time-dilution relationship in chemical sterilization.

- Many inconsistencies existed among the hospitals and even among the services of a given hospital. Examples of inconsistency were found in the length of time required to re-autoclave sterile equipment, different hand-scrub techniques for surgery and delivery rooms, and variance in the use of caps, gowns, and masks between surgery and obstetrics, also among types of personnel.

Nurses have assumed responsibility for investigating standard nursing procedures. However, Thomas said, they feel that this responsibility is not incumbent on them for procedures prescribed by the physician. The nurse has a professional responsibility for her personal hygiene. She should know how to protect her clothing from her patients and her patients from her clothing. She should determine a safe method for keeping her hands clean and whether the use of a mask would be a safety device for her or the patient. Unquestionably, the nurse develops the procedure for bathing adult patients, yet for the

care of an infant's skin she waits for medical prescription, she continued.

Therein, Thomas pointed out, lies the problem of not having specific answers to seemingly small details. The medical profession has not investigated prescribed nursing procedures extensively because its time

and interest are logically focused on the more scientific clinical factors of patient care.

Thomas believes that a committee representing various disciplines concerned with hospital patient care and management will provide a "common sense" approach toward such issues.

of community needs for preventive services, reported Dr. Helen Hart, health officer of Santa Barbara.

On G-Day in 1956, 680 persons were screened, 192 referred for followup, and 47 found to have glaucoma. On G-Day in 1958, 680 were screened, 97 referred for followup, and 11 found to have glaucoma. The median age of the 1956 group was 66.2 years, of the 1958 group, 61.3 years.

Participating in the preparation, screening, and followup of the 1956 event were the California committee of the National Society for the Prevention of Blindness, Santa Barbara's ophthalmologists and their office staffs, Delta Gamma Sorority, Santa Barbara Eye Foundation, Blue Cross, school and county health department nurses, the city health department, an optical company, the county clinic, and a drug company.

The screening at the city recreation center included visual acuity, fundus and tension examinations, and an interview.

Hart described the followup activities. Persons with definite or suspected glaucoma who did not have their own ophthalmologists were assigned to one according to an alphabetical list. They included patients who were unable to pay or who stated they could pay a reasonable fee. Appointments were arranged at the county clinic for those eligible to receive care there. Ophthalmologists were asked to notify the health department of any patients in the definite or suspect categories who were not seen. Persons with other eye conditions were notified and advised to seek medical care.

The community's ophthalmologists initiated and planned the second Glaucoma Day in 1958, delegating specific tasks to the same groups who cooperated in 1956. Screening and followup activities were similar to those carried out in 1956.

Hart counted these additional benefits of Glaucoma Day. The ophthalmologists regard recurring G-Days as a way to serve the community and inform the public about eye conditions. Also, they have be-

## The Chronic Diseases . . .

### Industry Know-How For Public Health

For combating chronic diseases, Dr. A. L. Chapman, Assistant Surgeon General of the Public Health Service, urged public health workers to employ methods that have proved their value in the commercial world, such as motivational research, product development and marketing, mass production, and automation.

Chronic diseases, he said, are an economic drag, contributing as they do to the dwindling number of producers in relation to the number of consumers in the United States. According to the National Health Survey, approximately 17 million persons are limited in their activities by a chronic condition and 1.1 million are confined to hospitals.

Long-lasting diseases, resistant to therapy or cure, absorb expensive quantities of goods and services for treatment, he stated, with no economic return.

Awareness of the economic drain of chronic diseases is apparent in the growth of dollar appropriations to the National Institutes of Health and other research organizations, Chapman said, although support for the application of research findings has been uninspired. Spending millions for research and pennies for application is like buying bread and not eating it, he commented.

Chapman advocated that the accounting practice of balancing product development with marketing, sales, and distribution be adopted in public health. He asked, Why do

children with rheumatic fever fail to get penicillin prophylaxis? Why are half the people in the United States with diabetes unaware of it? Where is the weak link in health's production line?

A conviction that ineptness in changing attitudes is one of the big handicaps of public health workers is responsible for the current rash of motivational research in the field.

He recommended also that automation and mass production will help laboratories to handle the growing analytical load of periodic physical and screening examinations. How else can the average laboratory handle a 10-fold increase in the present number of tests being performed, he asked. There are signs—the clinitron, the cytoanalyzer, and the autoanalyzer—that changes along these lines are in the making.

The laboratory director of the future, he predicted, will have to be teacher, trainer, researcher, and administrator as well as analyst. He will also have to obtain and commit a great deal more money to research projects and promote greater interest in the bread-and-butter importance of what his laboratory is doing.

### Glaucoma Day Furthers Community Services

The outcome of two Glaucoma Days in Santa Barbara, Calif., has been high casefinding rates and an awareness among ophthalmologists

gun another community service: vision testing of preschool children. The health department, in providing counseling, statistical, and followup services, gained understanding of its functions among the ophthalmologists and furthered a chronic disease program.

## Cancer Tests Given Scotch Verdict

Experimental carcinogenesis in animals was reviewed by Dr. R. E. Eckardt, director, medical research division, Esso Research and Engineering Company, Linden, N.J., with emphasis on the public health interest in the inconsistencies, limitations, and drawbacks of available techniques for evaluating food additives. Final judgment in many instances, he indicated, must be the Scotch verdict, "not proven."

Eckardt stressed that the species of animal and type of test should be considered in evaluating carcinogenic properties of chemicals for public health purposes. He cautioned against oversimplification by commenting on the inadequacy of fluorescent spectroscopy for determining carcinogenicity. Many non-carcinogens fluoresce. And fluorescence can be quenched in others. In the biological field, he illustrated inconsistencies of responses to the same material by describing identical research with various animals, comparing the effects on the species.

Eckardt recounted experiments on subcutaneous tissues which indicated that the physical state of a plastic material might determine its carcinogenicity. Observing that subcutaneous injections of sugar and cholesterol produce sarcomas in rats and mice, he concluded that subcutaneous tissues are inappropriate test sites for evaluating the safety of food additives.

Polyaromatic hydrocarbons produce tumors on the skin and cancer in the forestomach of mice, Eckardt said, but the forestomach of the mouse is lined with squamous epithelium, not glandular epithelium as

in the human. He noted that aminoazo compounds fed to rats result in liver tumors; however, there appears to be no counterpart to these experiments in man. Protein and riboflavin in the diet, he remarked, afford protection against these tumors; so does 0.003 percent methyl cholanthrene, a potent skin carcinogen.

Differences in susceptibility to specific carcinogens was confirmed by the observation that exposure to B-naphthylamine, and probably benzidine, produces bladder tumors in dogs and man, but in mice only when pellets are surgically implanted into the bladder. Eckardt suggested that it would be advantageous to develop understanding of the metabolic pathways involved with chemicals that induce tumors and cancers in various species of animals because if similar metabolic pathways are not present in the human, the likelihood of this compound being carcinogenic to man is probably quite remote. Recalling that 2-acetylaminofluorene, developed as an insecticide, produced a profusion of tumors at multiple sites in a variety of animals, he reaffirmed the need for testing.

In the field of food additives, Eckardt declared, experimental carcinogenesis is in its infancy. More basic fundamental research is needed. There is no one test or battery of tests of carcinogenicity which are appropriate for determining the safety of food additives. He recommended evaluating each compound to determine its chemical nature, probable concentration in the food supply, carcinogenicity, metabolic pathways in man and animals, and importance in our food technology.

## Planned Prophylaxis Cuts Rheumatic Fever Toll

Cooperative planning for rheumatic fever prophylaxis in Connecticut since 1955 was described by Dr. Nicholas P. R. Spinelli, chairman of the Rheumatic Fever Committee, Connecticut Heart Association, Horace A. Brown, executive director, and Nicholas J. Lavniko-

vich, program director, of the association.

An investigation and planning committee formed by the association advised intensive, statewide professional education on prophylaxis, as a foundation for the program. Through cooperation of the State's pharmaceutical associations, negotiation, and competitive bidding, "prohibitive" penicillin prices were lowered. Indigent patients received penicillin free. Physicians applied to the association for medication for each patient. The application form states the criteria used by the physician for diagnosis of acute rheumatic fever. Four prescriptions with coded stubs, a year's penicillin doses, were issued to each approved application. Weekly coded stubs were returned by wholesalers to the association for records on patients' prophylaxis maintenance. When the fourth prescription stub was returned, a reapplication form was sent automatically with queries on the patients' progress, cooperation, and other infection and recurrence information.

Each recurrence is investigated by the committee's area physician. Bona fide recurrences have been low. Patient delinquency has also been cut significantly by dropping those not using prescriptions for more than a year.

They attributed a 20-fold rise in the number of streptococcal cultures projected for 1959 over 1954 to education efforts.

They suggested that pregnancy may be a strong factor in casefinding because in the childbearing ages, 25-44, about 65 percent of the patients were women, as against a 57 percent proportion of women among all patients. The 25-44 age group accounted for 33 percent of all in the plan. Throughout, the usual relations of patient to physician and pharmacist were maintained.

## New York Experience

Another example of cooperative planning and operation in a rheumatic fever prophylaxis program



was reported by Dr. Katharine D. Brownell, director of the Manhattan Cardiac Program, New York City Department of Health, Margaret A. Losty, acting director of the department's bureau for handicapped children, and Helen M. O'Shaughnessy, director of community program, New York Heart Association.

The New York City Health Department and the New York Heart Association worked together within an established pattern of cooperation to set up a prophylaxis plan. Coordinated by a joint committee with visiting nurse representation, the program reaches more than 4,000 patients. Major obstacles were the high cost of penicillin and insufficient clinic staff for followup, revealed in a 1953 survey. These were overcome in large part by the association's purchase of oral penicillin for patients at clinics with approved programs and grants of heart association funds for selected followup services. The city also supplemented the supply of oral penicillin for clinics and the welfare department made it available for its clients.

In addition to intensifying case-finding in schools, for referral and followup, the health department promoted prophylaxis among physicians through consultations. The joint committee arranged discussion groups and guides for physicians.

The authors observed that in the two special health department prophylaxis clinics in the plan, verification of diagnosis has been acceptable to the referring physicians. Pinpointing followup as a weak element in the program, they consider that it can be strengthened by adequate clerical staff and well-planned and well-maintained files, supplemented by followup by the clinic social worker and the school nurse.

Followup is hampered also, they said, by frequent changes of residence and by the difficulty of keeping in touch with newly adolescent patients. A central registry

is helpful in maintaining followup of these groups.

The voluntary agency has been serving primarily as a catalyst, they concluded. It has also backed, on a demonstration basis, a clinic program reaching a large proportion of the city's medically indigent patients. In the development of a wider program under health department responsibility the support of other agencies, both official and voluntary, and practicing physicians, must be obtained.

### *The Michigan Program*

Physicians receive free prophylactic agents for treating rheumatic fever patients in nonacute stages in Michigan's statewide prophylactic program. In administrative structure, Dr. Carleton Dean, director of the Michigan Crippled Children

Commission, and Dr. George H. Agate, epidemiologist, City Health Department of Lansing, said the program utilized the pivotal role of the family physician.

Beginning January 1956, on termination of a successful pilot project in the Upper Peninsula, the Michigan Crippled Children Commission and the Michigan State Department of Health joined efforts. The health department distributes penicillin G and sulfadiazine to physicians and the commission finances medical supervision of injections to children in the commission's regular program.

Dean stated that continuous year-round medication was recommended for an indeterminate period. Rather than daily oral medication, monthly intramuscular doses of benzathine

### **Bargain Exhibits**

Two outstanding exhibits at the APHA conference, cited for excellence, also were models of economy.

The Public Health Service exhibit on seat belts, probably the busiest in the hall, was built for less than \$150 and can be duplicated for much less. It consisted of a table bearing a model of an urban street intersection, and four toy automobiles, built to explode on impact. These toy cars were purchased in a drug store. The only modifications for the exhibit were that toy figures were seated in the cars and rubber bands were installed to simulate seat belts for some of the "passengers." When the cars collided, passengers not restrained by the "belts" were thrown into the street, with impressively disastrous effects.

The Brookline (Mass.) Health Department exhibit on glaucoma, constructed at a cost of only \$50, was used in connection with the glaucoma clinic sponsored by the Brookline Lions Club and the Brookline Health Department. The message of the exhibit was: "Glaucoma should be found! Two to four percent of adults over 40 have glaucoma! Brookline finds it!" At no additional outlay, the exhibit was built around a slide projector owned by the health department. Twelve colored slides enabled a viewer to accompany a patient through the various steps and procedures of this clinic.

pencillin G were found to facilitate supervision of patients. Dean suggested that the child patient's emotional reaction to monthly injections might be studied as related to the plan's success.

When a child discontinues treatment, the commission queries the physician first. If no explanation is found, it writes the family. Follow-up continues if the family has moved. In the period, January 1, through June 30, 1959, 393 children were receiving prophylactic treat-

ment under the commission's jurisdiction. Excluded were 10 cases dropped because they could not be located after residence change and 10 others who discontinued treatment for unknown reasons.

Among needed ingredients for a good program, Dean mentioned cooperation of parents and the availability of diagnostic and consultation facilities, as well as the understanding and cooperation of the practicing physician in the community.

Flesch reading ease formula, Hoyman said, adding that statistical formulas were used to test the significance of the mean differences at the 5 percent level of confidence.

The findings, which agree with the pilot studies of Taylor, Hanson, and Zaharko, indicate that:

- Some widely used modern high school health textbooks, especially those used in ninth grade classes, are probably too difficult for average, below average, and poor readers to use effectively.

- Other widely used health textbooks, especially those used in the tenth grade or higher, are too easy for above average and superior readers.

- Apparently most new editions of health textbooks retained previous reading difficulty levels.

- None of the textbooks studied appeared to use reading difficulty progression, from less difficult material at the beginning of the book to more difficult in later chapters.

- The use of one health textbook for all students in one high school grade is apt to mean that the text is too easy for some and too difficult for others.

Many complex factors contribute to reading difficulty, Hoyman said, mentioning content, style, organization, and format. Readability yardsticks, such as the Flesch formula, test factors related to style only as a determinant of reading difficulty. The Flesch formula should not be expected to supply answers about the other aspects of readability of high school textbooks on health, Hoyman emphasized, although such tests do give valuable information in any effort to supply the students with an appropriate text.

Recommendations by Hoyman included discontinuance of the widespread practice of using one health textbook for all students in a given class or grade. The use of several textbooks permits individual assignment according to reading difficulty. He also suggested the possibility of reorganization of high school students into homogeneous groups within a grade or class, ac-

## Youth Habits . . .

### Good Adolescent Driving Reduces Traffic Toll

"In our culture, a child is passed from one authority to another—home, school, church, community. He is observed, evaluated, and regulated. And then suddenly he can get in his car and drive far enough in a short time to be anonymous and free, free to maim and kill himself and others. What is the solution?"

Dr. James L. Malfetti, executive officer of the safety research and education project of Columbia University, presenting this theme, stated that authorities claim drivers cause between 80 and 90 percent of the traffic accidents in the United States. He emphasized that drivers 16 to 24 years of age cause a disproportionately large number of the accidents which kill approximately 40,000 people a year.

Stating that if we can do something about adolescent drivers, we can significantly reduce the total number of accidents, Malfetti called first on parents to set a good example. He also called upon community leaders to build recognition of moral responsibility for traffic damage, injuries, and death through talks with license applicants. Other recommendations by Malfetti were:

- Higher quality tests for licenses.
- Realistic speed regulations.

- Improved driver education courses, emphasizing student decisions on good driving techniques.

- Rewards for courteous driving and lifesaving maneuvers.

- Clinics for chronic adolescent traffic violators.

Malfetti recognized that no driver, adolescent or adult, is immune to accident-producing behavior. He urged full use of mechanical devices in accelerating, steering, and braking, to correct or warn drivers when safe limits are exceeded. Such devices are available, Malfetti said, and others can be developed.

Rather than attempts to change basic personality traits of drivers, Malfetti recommended full use of techniques to curb the automobile when the driver fails to function at his efficient best.

### Teaching Health To Teenagers

Textbooks on health for high school students are too difficult in some instances and in others so easy as to be boring, according to Dr. Howard S. Hoyman, head of the department of health and safety education, University of Illinois, and his assistant, Aubrey C. McTaggart.

Eleven widely used high school textbooks on health were tested for reading difficulty using the 1948

cording to their reading and learning ability.

## New Thinking Needed On Teenage Drinking

Educators of teenagers are behind the times in methods of teaching the inherent dangers of drinking, Raymond G. McCarthy, associate professor of health education at Yale University, suggested.

Teaching about alcohol has been required by law for many years in every State, he said, but primarily to encourage total abstinence by emphasizing the dangers of drinking. The ineffectiveness of the psychology-of-fear approach is apparent in the fact that approximately 70 percent of all adults over the age of 15 years use alcoholic beverages. Research among high school students in New York, Wisconsin, and Kansas, he continued, reveals a substantial proportion of drinkers, many with parental consent.

McCarthy believes these statistics challenge the traditional classroom approach to alcohol education in public schools. Information about the bizarre results of alcoholism, which affects roughly 6 percent of all users of alcohol, is of little significance to teenagers, he stated, adding that it would be more realistic to emphasize the dangers of intoxication and its attendant traffic accidents, violation of family or church standards, and behavior disturbing to the individual.

Teaching should embody a set of facts about alcohol as well as consideration of different attitudes toward alcohol use and nonuse in our society. The schools have not translated this change in cultural attitudes into classroom practice, McCarthy concluded.

## Teens Determine Smoking Habit

Smoking in the United States can be curbed best by informing young people of its risk to health, asserted

Dr. Roger S. Mitchell, director of the Colorado Foundation for Research in Tuberculosis and associate professor of medicine, University of Colorado.

Stating that cigarette advertisers direct multimillion dollar campaigns to solicit "still unaddicted teenagers," Mitchell said, it would not be a bad idea to "take a leaf out of their book."

In reviewing what he termed "presently available facts with regard to smoking and health," Mitchell reviewed published data on the rising tobacco consumption for the past 60 years; total death rates by age and smoking habits; mortality ratios by amount of smoking, for ex-smokers, and for various causes of death; various causes of excess deaths among men who smoke regularly; male death rates for various diseases and lung mortality rates for men, by amount smoked; lung cancer mortality rates for rural and urban residents; comparative smoking habits of men and women; and trends in environmental factors.

Mitchell believes smoking is one of the multiple causes of lung cancer; shortens life by at least 5 years, through increased risk of atherosclerosis, cancer, and chronic obstructive airway disease; shortens breath; impairs physical performance; and aggravates or delays healing of stomach ulcers.

High school students can be taught the hazards of smoking, Mitchell stated. He recommended:

- Efforts to engender student requests for health education on smoking.
- Question and answer sessions.
- Participation by parents, local and national medical societies, health organizations, and legislators.
- An adult approach, emphasizing the maturity of self-restraint and discipline.
- Minimal smoking, preferably pipes, for those addicted.
- Research which will lead to the elimination of injurious factors in smoking.
- A good example by parents and adult associates.

# Gerontological Studies . . .

## Aging Population Needs New Mores

With a significant increase in average life expectancy, major social changes are needed to reap full advantage from the added years. In the opinion of Dr. Edward L. Bortz, medical service chief, Lankenau Hospital, Philadelphia. Customs and social attitudes, he says, ought to esteem maturity and recognize its potentials. Also, he said, the family must be bolstered as a setting for aging.

A new index for aging, based on biological condition, such as performance and capacity, Bortz said, would be a more satisfactory yardstick than the calendar. However, much of so-called physical evidence of age, he said, is actually evidence

of conditions which with foresight could be prevented or at least delayed.

Citing the ramifications of a Cornell longevity study on laboratory animals, Bortz envisions an average human life of 100 healthy years. These he divides into trimesters, the last called the "summit of the years," in which intellectual growth and social participation may continue after 80. Much deterioration is avoidable through sensible health practices, he pointed out, referring also to promising experiments to retard deterioration of tissues of the vascular, skeletal, and nervous systems.

Deploping the current practice of retiring healthy and active workers from established occupations, he stated that a second career could

begin at 65, with retirement deferred to 85 or 90.

Physicians and medical educators, Bortz concluded, have a major function in determining whether or not the added years are to be characterized by weakness, depression, and deterioration, or "by flowering of the major powers inherent in each citizen."

## Aged Seek Services More Than Beds

To weigh the present and future load of chronic illness in Monroe County, N.Y., the agencies concerned and their patients were analyzed in a study reported by Walter Wenkert, secretary of the health division, Council of Social Agencies, Rochester, N.Y., and Dr. Milton Terris, professor of epidemiology, Tulane University School of Medicine. A major conclusion is that strengthened services may obviate the need for additional beds.

The 18-month study was originated by a citizens committee and financed by the Community Chest and the County Board of Supervisors. Eight general hospitals, 4 long-term hospitals, 30 private nursing homes, 8 infirmaries of homes for the aged, and 16 public health nursing agencies were questioned about admission and discharge policies, scope and purpose of services, staffing patterns, staff education and training, costs, income, and future plans.

The medical staffs or administrators of the agencies and institutions supplied 1-day census information on 3,780 patients. Each member of a clinical review team (physician, public health nurse, and social worker) independently interviewed 170 patients, a random sample of the census group.

The clinical review team differed with the staffs of the agencies in judgments of appropriate levels of care. The team felt that 85 percent of the hospital patients, but only a third of the home care patients, were receiving care at the appro-

priate level; the agency staffs felt that 41 percent of the hospital patients and 70 percent of the home care patients were at the proper level of care.

If the team's judgments on levels of care are projected to the total study population, new and strengthened services should be planned and created before installing additional hospital, infirmary, or nursing home beds, the authors concluded.

They pointed out five major gaps in services which the study disclosed.

- *Physicians need the assistance of nurses, psychologists, physical therapists, social workers, and other professional persons to evaluate a patient's total care requirements.*

- *Rehabilitation services, in the form of occupational therapy, medical social work, and recreation, as well as physical medicine, are needed in hospitals, nursing homes, homes for the aged, and for home care patients.*

- *Of the 3,780 patients, from 88 to 554, if the review team's judgments concerning the random sample are projected to the total study group, need organized home care.*

- *Agencies, because they are limited by their special concerns or by other requirements, are unable to provide the multiple services needed by patients with chronic disease.*

- *Although there were 76 clinical projects related to chronic disease in the county, no research was being done on the administrative, operational, or service aspects of long-range care. There were no formal affiliations among institutions providing different levels of care to share professional services and facilities.*

Plans to pursue specific recommendations of the study are being made by these institutions: A home for the aged is evaluating intake policies. A hospital is preparing a comprehensive rehabilitation program. A hospital, the health department, and the visiting nurse service are developing an organized home care program. Joint services are being arranged between a gen-

eral hospital and a home for the aged. A convalescent hospital for physically handicapped children is being closed. The council of homes for the aged is defining and cost accounting levels of care. Blue Cross, the medical society, the hospital council, and the study's followup committee are increasing voluntary health insurance coverage among the aged.

## First Admission Study Asks Why Aged Crack

Causes of mental breakdown among the aged were sought in a study of the background of 26,645 first admissions to Ohio State mental hospitals January 1948 through June 1952, reported by Ben Z. Locke and Dr. Morton Kramer, biometricians, National Institute of Mental Health, and Dr. Benjamin Pasamanick, research director of the Psychiatric Institute and Hospital, Columbus, Ohio.

Of the total studied, 5,676 were diagnosed as having mental diseases of the senium. These, it was observed, were more likely than not to come from cities, to be male, to lack higher education, and to be divorced, separated, or single rather than married. Among women, the rate of admission was higher for those employed at jobs other than housework. Among men, occupations having the higher rates of admission were laborers, farmers, service workers, and craftsmen.

For confidence in these findings, the authors remarked, supplemental data is needed on mental illness among the noninstitutionalized and in other facilities for aged mental patients.

Although population records suggest the probability of a marked increase in admissions of mental patients with diseases of the senium, by 1980 more than 60 percent above the 1950 level, there are social changes which they feel may offset this trend.

Apart from population changes, there may be developments in institutional care, community services, and home visiting, they said, which

will affect the mental conditions of the aged. Attitudes of both the aged and the community also may be altered, they suggested, in a direction that will reduce present mental distress. For example, they mentioned services which would offset the mental and physical effects of inactivity and confinement, or attitudes which would help the ex-breadwinner to adjust to a new status.

On the whole, the authors believe changes are in the direction of supporting mental health for the aged. Physical labor, they predict, will become less taxing, income more certain and more nearly adequate, constructive use of leisure time more common, nutrition and other health services strengthened, and educational levels raised. The character of institutions for the aged, they predict, will become more acceptable also.

## Mental Ills of Aged Need Special Care

Knowledge of the role of homes for the aged in meeting the health needs of our senior citizens is meager, reported Dr. Franz Goldmann, director of health study, Council of Jewish Federations and Welfare Funds of New York City.

A large-scale inquiry into coordination of medical care in chronic illness, supported by the Public Health Service, presented an opportunity to investigate the part played by homes for the aged. Cross-sectional case studies made in the spring of 1958 covered 530 residents of five Jewish homes for the aged, in Chicago, Miami, Philadelphia, St. Louis, and Toronto. Descriptive material on organization, functions, and relationships in 1957 was collected from 70 such homes in the United States and Canada.

Findings, according to Goldmann, showed almost all of the 530 residents of the five homes have multiple chronic ailments. Many are substantially disabled. The well resident is the exception.

The most common affliction is men-

tal impairment, with symptoms of temporary or continuous confusion. Marked emotional disorders are widespread among the residents studied, Goldmann reported.

The detailed analysis of 70 homes revealed that most of these institutions perform the functions of high-grade nursing homes and emphasize comprehensive health service, including psychiatric care, and teamwork. Goldmann said the

experience gained at homes with relatively advanced psychiatric service clearly demonstrates its value to the patients and the possibility, through more widespread use of such service, of reducing transfers to mental hospitals to a minimum.

A realistic policy is needed, Goldmann added, for both the long-term institutional care of persons in ill health and the housing of senior citizens capable of self-care.

## Water and Wastes . . .

### Contract Health Services Overcome Complexities

Small municipalities, financially unable to maintain a health officer and health services of their own, are contracting for such services through county or State health departments, according to H. Clifford Mitchell, director of sanitation, St. Louis (Mo.) County Health Department.

A number of such communities have purchased sanitation services, and school districts have obtained mental health, dental, and nursing services through contracts in the past few years, Mitchell reported. His own division of sanitation, which serves the metropolitan St. Louis area excluding the city of St. Louis, has in 5 years expanded its services in this way to more than 200,000 persons previously without health services, he said.

St. Louis County's population increased from 274,000 in 1940 to 700,000 in 1959, and the number of its municipalities rose from 40 to 98, with an accompanying demand for municipal sanitation services such as refuse and rodent control, water supply, sewage disposal, swimming pool inspections, air pollution control, and industrial hygiene.

Legislation restricted the county health department from providing health services directly on a county-

wide basis, requiring each municipality to provide its own, but county ordinances made contract service possible.

The first attempt at such cooperation, limited to restaurant inspection and rabies control, was so well received, according to Mitchell, that in 1954 the county entered into a unique contract with the city of Jennings, Mo., population 18,000. Under this arrangement, the county health commissioner took on the duties of health commissioner of Jennings without an additional remuneration, one well-trained and experienced sanitarian was assigned to the community full time, and the sanitation code of the county was accepted by the municipality. The city supplied office space and all utilities and reimbursed the county for the sanitarian's salary and transportation.

At the end of a 12-month trial, the mayor and council of Jennings petitioned for continuation of the service indefinitely. Scores of other small cities followed Jennings' example, and the county department is now giving contractual services to 52 municipalities, Mitchell reported.

He pointed out that this procedure provides a partial solution to a tough problem and that both community and department gain from it. The municipalities receive their necessary sanitation and other health services from competent personnel at reasonable cost; the county health depart-

ment gains through development of closer ties with cities and greater control over countywide problems of public health.

Mitchell admitted it would be easier and less cumbersome to have sufficient funds and appropriate legislation to provide uniform services throughout the county without regard to municipal boundary lines, but the contract program does keep department personnel on their toes to provide satisfactory service. They know they are directly responsible to the governmental agency which is contracting for the service and that contracts can be canceled upon 30 days' notice. The procedure has been studied by a number of organizations such as the League of Municipalities, the Ford Foundation, and the American Public Health Association, Mitchell said.

## State Board Promotes Water Enough for All

Adequate water supplies, reported Dwight F. Metzler, chief engineer of the Kansas State Board of Health, are a basic public health responsibility. On this principle, State resources were directed to help communities in Kansas overcome recent, present, and prospective water shortages.

Deficient water supplies in American cities, he recalled, had been reported recently by the American Water Works Association, which found many American cities over 25,000 lacking capacity in water mains, pumping capacity, and storage facilities.

At the same time, demands for water have been complicated by increased per capita use in a growing population.

Although not a single case of waterborne disease is known to have resulted from deficiencies in their systems in recent years, many Kansas cities had come to the point of rationing water uses in the dry years of 1952-57. Following an investigation of the water shortages, the State discovered the main factor was not a

lack of water but a lack of planning for its storage, treatment, and distribution.

Emergency efforts to supply deficient communities included hauling, temporary treatment systems, cloud seeding, and reuse of waste water. Long-range efforts included evaluations of municipal supplies and encouragement of efforts to improve and expand water systems.

Metzler estimated that it takes from 3 to 5 years to proceed from the finding that facilities are needed to complete plans, gain official and public acceptance, and complete financing and construction.

The State water resources board has taken the main responsibility for determining the availability and quantity of ground water, as the State board of health has for determining the chemical quality. Information on hydrology has been included in an annual program of inservice training for consulting sanitary engineers with some consequent changes in design practice.

A critical element in the program, he said, has been the periodic appraisal of water systems by board engineers, who follow their reports with appearances before the governing bodies of the cities, to explain the deficiencies and to urge their correction. Supporting this pro-

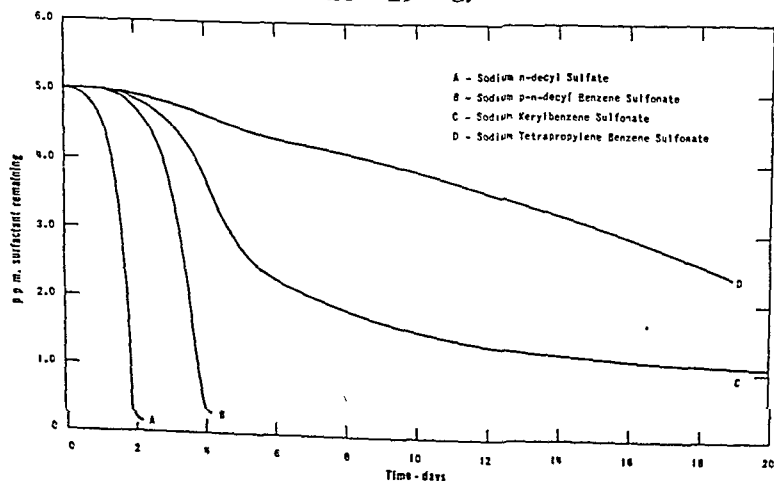
gram, the League of Municipalities in Kansas prints annual board of health tabulations of municipal waterworks data, including capacities and daily demand.

## Identifies Guilty Syndet Agents

The main source of the public health problems created by the Nation's current annual consumption of 3.8 billion pounds of synthetic detergents was identified by Jesse M. Cohen, Robert A. Taft Sanitary Engineering Center, Public Health Service. He also reported that active research on new forms of detergents offers a possible release from the present difficulties.

Surfactants of the ABS-type, the most common cleansing agents of today's syndets, were specified as responsible for some water and sewage plant problems which have emerged in recent years. Among the problems he mentioned are frothing in aeration tanks and outfall lines in sewage treatment plants, ABS residues in sewage effluents, additional phosphate nutrient for growths of algae with their attendant problems, and contamination of ground water and drinking water with ABS residues. Many of these effects, he said, are due to one outstanding difference be-

**Decrease in concentration of detergents in river water at 18°-19° C.**



tween soap, almost the exclusive cleaner 20 years ago, and the syndets currently in use.

Whereas soaps are easily decomposed by biological activity, the common syndets employing ABS-type surfactants resist biological decomposition. For this reason, he explained, syndets can survive, at least in part, sewage treatment, natural biological oxidation processes in streams and ground water travel to appear in varying reduced concentrations in drinking water. An early evidence of detergent pollution is foaming of tapwater, which occurs with concentrations as low as 0.8 ppm.

All detergent molecules, both soap and syndet, contain a long hydrocarbon chain. In soaps, which are derived from fatty acids, and in syndets derived from fatty acids or alcohol, the hydrocarbon chains are readily decomposed to smaller fragments and eventually to carbon dioxide and water.

The raw material for the more commonly used ABS-type surfactants is propylene, which is obtained from petroleum. The processing of propylene for these surfactants yields a detergent molecule containing an alkyl group which is a saturated, highly branched hydrocarbon. More important, this hydrocarbon chain contains a quaternary carbon atom. Extensive biochemical studies have shown that this chemical structure of ABS prevents microbial oxidation and makes it possible for the ABS molecule to persist in biologically active solutions like sewage or streams.

The accompanying chart illustrates the rates at which the various types of surfactants are decomposed in river water. Compounds A and B, derived from fatty acid and straight-chain hydrocarbons, are biologically decomposed in 2 to 4 days. Compounds C and D, the ABS-type containing an alkyl group of petroleum origin, persist for longer than 20 days, which is long enough for this contaminated water to arrive at a water treatment plant in the water supply.

Up to the present time, there is no economical way of removing surfactant material from drinking water. Common water treatment processes, such as chlorination, chemical coagulation, and rapid sand filtration, reduce surfactant concentrations by either insignificant amounts or not at all. Current research is therefore directed primarily toward removal at the sewage treatment plant.

Research in another direction is of equal importance. Consideration has been given by manufacturers to development of other compounds equal in cleansing properties to the present surfactants but different in that they would be vulnerable to microbiological degradation.

### Private Swimming Pool Standards Given

Swimming pools in the backyard and their public health implications were discussed by Edward L. Stockton, municipal public health engineer, when he reported on standards of construction and operation of privately owned pools, as recently established in Grand Rapids, Mich.

Stockton stated that a simple system of requirements has a better chance to achieve satisfactory operations. Main requirements are a 4-foot fence surrounding the pool; a minimum of two inlets on rectangular pools, more on free-form pools; complete replenishment of water within every 12 hours, with rate of filtration not to exceed 3 gallons per square foot per day; and uniform application of chlorine to maintain a constant residual of between 0.4 and 0.6 parts per million.

Most pools are either 16 by 36 feet or 20 by 40 feet in size, he continued. Diatomite filters are used on all newer pools, and skimmers instead of scum gutters. Pressure gauges or rate of flow gauges are not required.

Chlorination machines are permitted, Stockton said, adding that most people use chlorine tablets. When liquid hypochloride is used, it is suggested that one-half cup of

Calgon per 15 gallons of solution be added to prevent clogging and aid in pH control.

Water in all pools in Grand Rapids was sampled twice in 1958 and 1959. Thirty percent of these samples were unsatisfactory on bacteria plate count and 26 percent by coliform index, mainly as a result of an insufficient period of filtration. Samples of water compared with chlorine residuals at time of sampling showed approximately the same percentage of unsatisfactory results.

Examples of difficulties were cited by Stockton. Many pools are not operated 12 hours or longer. As a result, he said, it has been impossible to enforce the requirement of replenishment of water every 12 hours. Many operators are not aware, he added, that diatomite filters must be recharged when a pool is reopened.

Stockton also mentioned instances of plastic lines connected directly to the sewer for backwashing operations. He said closer field inspection will be necessary to prevent the installation of such cross connections.

Adoption of a city ordinance is essential, Stockton stated. He recommended a reasonable attitude in stating pool requirements, emphasizing that these requirements should have broad functional outlines rather than being confined to specific details. Because of the rapidly changing picture in pool installations, specific standards tend to halt full use by the public of new and better designs.

### Pay-as-You-Grow Sewer System

A complete suburban sewer and sewage treatment system, financed as easily as a piecemeal program, with an eye to the needs of the next generation, was described by Peter Homack, consulting engineer of Elson T. Killam Associates, Inc., Millburn, N.J.

Square in the path of a growing urban population, the township of Berkeley Heights, N.J., in 1955 confronted the familiar issue: to be or not to be dotted with septic tanks. Despite a low population density, with fewer than 1,000 homes in an area of 6.3 square miles, the township found its subsurface disposal systems, including septic tanks, tile fields, and cesspools, were a menace to families on the lower slopes. Impervious soil, traprock, and a high table of ground water gave little opportunity for remnants of domesticity to sink harmlessly away.

Builders, eager to add to the value of real estate in the township, were disappointed to learn that their plans for installing more individual disposal systems, under a tightened State health code, would be disapproved. As they presented alternative proposals for sewage treatment plants for small neighborhoods, the so-called package plants, township authorities began to look into the possibility of a central system.

The builders agreed to a prepayment assessment of \$350 per house projected. A capital improvement fund of the township contained another \$150,000. The builders also planned to install at their own expense lateral and interceptor sewers passing through their properties. As a result, nearly half of the cost of the system was supported by builders of 112 new homes. The balance was financed with bonds backed by the credit of the township.

Construction started in 1956. The treatment plant began operation the following year. Since then, 300 homes per year have been connected to the system, and neighboring communities are asking for an opportunity to tie in. It is probable that with revenues from other townships, and a local sewer service charge of \$20 per home connected to the system, the income from the plant will exceed its operating and carrying charges.

With extension of the sewer system to 80 percent of the homes in the township, 1,600 units will be connected. The total cost of the sys-

tem, including lines paid for by builders, is about \$3 million.

The design, however, provides for an eventual population of at least 20,000. The sewers are large enough to be adequate for the township population 40 years in the future, and the treatment plant is meant to serve without expansion for about 15 years.

The annual interest and amortization charge, said Homack, is no more than it would have cost to undertake a limited sewer construction program, year by year.

## Package Plants Evaluated

Package plants are here to stay is the conclusion of John E. Kiker, Jr., professor of civil engineering at the University of Florida. But he believes many improvements in design and operation are necessary.

A study of such plants, in comparison with conventional sewage treatment plants, was undertaken in Florida in 1958, under the general sponsorship of David B. Lee, director of the bureau of sanitary engineering of the State board of health, with collaboration of the university and the Public Health Service.

Under far from ideal conditions, the investigation succeeded at least in improving its methods of evaluation, and in developing information which led Kiker to draw certain conclusions, as follows:

- Effective results with package plants, some of which were excellent, depend on the quality of maintenance and operation. For comparable results, conventional plants need less attention than the others.

- There is as yet no such thing as a "maintenance free" package plant. No mechanical aeration plant has "only simple mechanical components." Troubleshooters ought to be available wherever such plants are installed.

- All plants should have convenient and accessible flow measuring devices, preferably with a totalizing meter or recording device, as

well as electric power meters, if costs and performance are to be appraised.

- Plants which do not have adequate laboratory facilities, or sanitary facilities, including showers for personnel, are seldom operated properly.

(A student, John E. Hagan III, who shared in the investigation, commented, "Lack of laboratory facilities greatly hinders the operator. There is always a tendency to leave undone anything which seems inconvenient or difficult; also, where the operator has many other duties, the time element may become important. Convenient laboratory facilities will greatly reduce the tendency to overlook routine lab work.")

- Composite daytime samples are more suitable for evaluation of package plant operations than those taken around the clock.

- Designers of sewage treatment plants would do a better job if they gave more consideration to operating tasks. Many plants are designed without provision for steps or sampling facilities. Other deficiencies, sometimes hazardous, are an absence of handrails around tanks, inadequate walks, open channels, and insufficient lighting.

- Plants should be at least 500 feet away from the nearest residence, as a protection against noise and odor.

- Air compressors should be provided in duplicate, as insurance against a failure.

Further studies of cost, design, and operation are recommended by Kiker.

## Design for Burning Urged for Refuse

Nothing is wrong with incineration that proper design and operation cannot cure, according to Glen H. Abplanalp and Junius W. Stephenson, consulting engineers with Haydens and Emerson, New York City.

Tracing the history of incineration, they put much of the responsibility for failures on the tendency to



accept manufacturers' designs and ratings, rather than designs and ratings independently determined. Only Connecticut, they said, has set State criteria which incinerators must meet, and they said none of the burners installed in recent years in that State are known to be unsatisfactory.

A technological change which encourages incineration, they said, is the increase in the marketing of trimmed food. While the packers sell the stems and peelings and other trim for processing as fertilizers, the ratio of garbage to rubbish in domestic refuse has declined from 50-50 to 10-90. As a result, modern refuse is lighter, drier, bulkier, and more combustible than in the past, with the result that, in operating an incinerator today, the task is often one of holding temperatures within reasonable limits while maintaining desired burning rates.

States should give attention to incineration, they said, because the supply of land suitable for fill operations is limited. Nevertheless, only Connecticut, Florida, and New Jersey require that incinerators be designed by qualified engineers. Only Hawaii, New Jersey, and Oregon have established specific regulations for incinerator operation, but in each case the regulations are based entirely on air pollution standards. The authors recommended that standards apply also to storage, handling, safety, residue disposal, and general sanitation.

The consensus of State officials, they said, favors closer State control over all phases of refuse disposal, with detailed regulations and power of enforcement. The authors concluded that health departments logically should guide refuse disposal in a manner comparable to their present guidance of water and sewage treatment.

## Landfills Replace Jersey Dumps

The figures tell the story of New Jersey's achievement in developing sanitary methods of refuse and gar-

bage disposal, under chapter 8 of the State Sanitary Code, which became effective July 1, 1958, according to Alfred H. Fletcher, director of environmental health, and John Zemlauský, principal sanitarian, of the State health department.

The number of sanitary landfills in the State at that time was 33, serving 149 municipalities with 19 percent of the population. (Another 16 percent were served by 18 incinerators.)

Fifteen months later, 100 sanitary landfills served 299 municipalities, with 44 percent of the State population. (The 16 incinerators still in operation then served 12 percent.)

First move in the change came with the recommendation of a 1953 advisory committee, proposing legislation to outlaw open dumps and to establish a code for sanitary landfills.

While the program still has room to advance, the experience to date is useful to the remaining municipalities of the 567 subject to the code.

Two landfills charge for disposal by weight, at rates ranging from \$1 to \$3 a ton.

Others charge from 10 to 30 cents per cubic yard.

Still others charge \$2 per truck load, or \$1 to \$1.25 per person per year. A few charge \$1.25 to \$3.50 per family.

Hauling distances run as high as 28 miles, but no municipality is more than 10 miles distant, in a beeline, from a sanitary landfill.

The authors find that landfills are less costly to operate than the open dumps they are replacing, in part because vehicles suffer less damage on the compacted terrain. Another economy is that landfills do not require the waterlines needed to control spontaneous fires in dumps, or policing, or the legal services which surround a public nuisance.

Most collection and disposal of refuse in the State begins with a contract between an individual household and a private contractor. This system characterizes suburban settlement. The greatest volume of refuse is disposed of under contract between a municipality and private enterprise, obtained by competitive bidding. The least prevalent method is municipal ownership and operation of the system.

# Air Pollution . . .

## Atmospheric Pollution Public Worry No. 5

Air pollution ranked fifth in seriousness among 10 selected community problems in a survey of public awareness in Erie County, N.Y., reported Dr. Preston Valien, former technical consultant, New York State Air Pollution Control Board, Albany. Outranking air pollution, according to respondents, were unemployment, automobile accidents, juvenile delinquency, and alcoholism. But air pollution outranked factory accidents, contagious diseases and epidemics, sewage disposal, exposure to radiation, and home accidents.

A probability sample of 462 households in Buffalo and 481 in the county, with respondents classified by sex, educational level, socioeconomic status, and residential areas, was surveyed, Valien explained.

Slightly more women than men viewed air pollution as a serious problem. Air pollution was designated as "very serious" by 19 percent of the group, "somewhat serious" by 16 percent, and the rest considered it "not serious" or didn't know.

By educational level, the percentage of respondents describing air pollution as "not serious" ranged from 47 percent of those completing

eight grades or less of schooling to 69 percent of those with some college training. Seventeen percent of those in the lowest educational category and 25 percent of those at the bottom fourth of the socioeconomic scale answered "don't know" concerning the seriousness of the air pollution problem, said Valien.

Only 53 percent of those questioned thought air pollution was definitely a public health matter, although nearly 80 percent classified control of contagious diseases and epidemics and sewage disposal as public health concerns. The concept of air pollution as a public health matter did not vary on the socioeconomic scale or by rental area, but it was recognized more frequently as educational level went up.

The interviewees were asked to indicate any physical discomforts and property damages which may have resulted from polluted air. Unpleasant odors were named by 42 percent of the Buffalo residents and 29 percent of the county residents. Coughing, sneezing, and difficulty in breathing were listed by 10 to 13 percent of the Buffalo respondents.

Property damages from air pollution, reported by 59 percent of those in low rental residential areas and 48 percent in the high rental areas, were listed most frequently as dirty house paint, dirt on the family wash, and damaged car paint, the author said.

Air pollution had a bad effect on people's health, 87.5 percent of the group believed, was bad for real estate values, thought 80 percent, and had a bad effect on business in general, 60 percent felt.

Asked to name important sources of polluted air, 80 percent named factories; 61 percent, buses; 53 percent, city dumps; 45 percent, automobiles; and 11 percent, homes. In investigating how the respondents' actions contributed to air pollution, approximately 30 percent said they sometimes burned leaves, papers, or trash at home, and 60 percent of these had done so within the previous week.

Forty-five percent of the group said they had read or heard something recently about air pollution, most often that it was a problem in other States, Valien said. Asked to give sources they would depend on for information about air pollution, 41 percent preferred newspapers; 21 percent, television; 18 percent, radio; and 17 percent, pamphlets. However, these responses varied according to educational level, with pamphlets named primarily by the college group, and television by the less educated. These preferences for a specific medium as an information source have important implications in educating the public concerning air pollution and other aspects of health information, said Valien.

## Mortality Data Reflects Air Pollution

Use mortality data to study possible health effects of air pollution, suggested John C. Rumford, public health analyst, Air Pollution Medical Branch, Public Health Service.

He outlined simple procedures which local health agencies can employ to compare intra-area and temporal variations in mortality to variations in indexes of air pollution and other environmental factors.

Intra-area or intracity investigations are based on the assumption that if there is an association between manifestations of air pollution and mortality, residents in areas of high pollution should have higher mortality rates. Because these areas usually have other adverse environmental conditions, the total socioeconomic complex of an area must be considered, he said.

In these analyses, he explained, the study area is usually subdivided into components such as census tracts, community areas, economic areas, or health districts with available population statistics. The subdivisions are then characterized by manifestations of air pollution and other factors such as income, hous-

ing, education, and racial composition.

Rumford cited, as an example, a study of Philadelphia health districts. Preliminary results suggested that pneumonia and arteriosclerotic heart disease were apparently equally influenced by both variation in dustfall and socioeconomic variables. Variation in chronic rheumatic heart mortality was more strongly related to dustfall than to any of the indexes of socioeconomic conditions. Variations in mortality for other diseases of the heart and tuberculosis were more closely associated to socioeconomic indexes than to dustfall. Such relationships should be studied further to see if a true association has been divulged, said Rumford.

He described another intra-area study, made in Chicago, to develop and test methods applicable to micro-units of a large metropolitan area. The study population was limited to white females, since residence in a particular census tract was of prime importance. Three approaches were used. In the first, mortality variations among residents of manufacturing and nonmanufacturing areas of Chicago were compared. The results suggested that those living in nearly all manufacturing areas experienced higher mortality than residents of nonmanufacturing areas.

The second approach was to compare mortality experience among residents who lived 1 mile from a large primary metals plant with that of residents living from 1 to 2 miles from the plant. In census tracts less than 1 mile away mortality was more than 30 percent higher than in the tracts 1 to 2 miles away.

The third approach was to investigate residential mortality variations in census tracts less than 1 mile from the plant in relation to prevalent wind direction. Results indicated that standardized mortality rates were highest for those living in quadrants more frequently in the path of winds blowing across the plant. Socioeconomic conditions of the area apparently contributed little to mortality variations.

In the second major category of investigations, the temporal study, it is assumed that mortality rates for selected diseases should increase or decrease with abnormal increases or decreases in actual measurements of air pollution or a manifestation of pollution, he said.

Methods used in temporal studies vary with the geographic and time units chosen. If an entire city is used, abrupt departures from the normal levels of air pollution are plotted graphically with mortality incidence. Weather factors such as maximum and minimum air temperature, rainfall, snowfall, and humidity are plotted as third variables. Usually, positive fluctuations occur in all variables when threshold levels of air pollution are reached. Therefore, the difficulty is in determining which variable fluctuated more directly with mortality.

For example, when an extreme high-pressure air mass over New York City created stagnant atmospheric conditions for a 4-day period in October 1956, cardiovascular mortality increased sharply. Graphing of the variables revealed a 2-day lag between temperature and mortality peaks in contrast to simultaneous peaks in dust count and mortality.

Temporal studies have also been done during prolonged steel strikes. Admittedly, these investigations suffer from handicaps such as a population too small for significance tests of a small percentage effect and extremely limited air pollution data. Also, there are numerous variables and conflicting factors in studies of this type.

In spite of these reservations, the Air Pollution Medical Branch hopes such studies will assist, guide, and stimulate air pollution-health studies, Rumford declared.

## Effects of Donora Air Continue Uncertain

Persons who reported acute illness at the time of the 1948 air pollution episode in Donora, Pa., have demon-

strated subsequently higher mortality and prevalence of illness than other persons living in the community at that time, according to Antonio Ciocco and Donovan J. Thompson of the department of biostatistics, graduate school of public health, University of Pittsburgh, reporting on a followup study made 8½ years after the episode.

Furthermore, persons who complained of more severe acute illness in 1948 demonstrate greater subsequent morbidity and mortality than persons with mild complaints, they said. There is some evidence that this greater morbidity and mortality is related to the cardiorespiratory system, Ciocco and Thompson reported. However, they cautioned, "Before these facts are hastily interpreted a more searching analysis is required."

They pointed out that many smog victims in Donora had reported chronic cardiorespiratory illness before 1948. If their histories are disregarded, the differences in the rates of illness and death among those acutely ill during the smog and those who did not experience illness then are narrower.

The 1957 data showed that even persons who denied a history of heart disease prior to October 1948 but became ill during the smog episode have had a higher subsequent morbidity rate than persons of the same age and sex who did not become ill. Mortality was also higher, although the difference is less marked. At face value, they said, it would seem that subsequent health experience is related to complaints first arising during the 1948 episode. However, there is often considerable underreporting of impairments in interview surveys, Ciocco and Thompson pointed out. If any significant amount of such understating of previous illness did occur in 1948, the 1957 findings would mean that discomforts of the smog episode only served to bring out or emphasize existing impairments.

The Public Health Service community survey made shortly after the October 1948 acute episode, covered

a systematic one-third sample of Donora's households, involving 4,092 residents. Data were obtained on:

- Age, sex, occupation, residence.
- Past experience of asthma, sinusitis, heart disease, chronic bronchitis, tuberculosis.
- The occurrence of cough, nausea, vomiting, headache, and smarting of the eyes during the October pollution episode.
- The persistence of these symptoms.
- Physician and hospital service treating the ailments.

For their 1957 followup studies, Ciocco and Thompson were able to trace slightly more than 99 percent of the original 1948 group by personal interview and mailed questionnaires.

## Troublesome Questions

Ciocco and Thompson had hoped to obtain an indication of the relative significance of the acute episode and chronic exposure over the years. However, no such clear relationship between illness and environmental variables, such as period of residence in the Donora environment, place of residence in the community, occupation and place of work, has been established by the study.

The findings of the study, they said, raise three central questions:

1. To what extent is the subsequent health experience of those persons who became ill during the 1948 smog related to complaints first arising during the episode or to complaints present before the episode?
2. To what extent is the greater morbidity and mortality a direct consequence of short-term massive exposure to air pollutants, or continued exposure both prior and subsequent to the episode, or a combination of the two types of exposure?
3. To what extent are the manifestations of sickness specifically related to the particular pollutants in the Donora air?

Although some of the data do point to some effects on the cardiorespiratory system, they do not provide the means for relating particular pollutants to specific systems. The lack

of knowledge as to what syndromes appear most pertinent for air pollution-health studies is vexing to all researchers in this area, Cioceo and Thompson said. The efforts and experience of many investigators will be required before the relation of continued exposure to airborne pollutants and health in large population groups is clear, they declared.

## Air Pollution Control Tasks Lie Ahead

Air pollution control has scored remarkable gains in Pittsburgh and Allegheny County but much remains to be done, according to Lee Schreiber, Jr., acting chief, Bureau of Air Pollution Control, John J. Grove, assistant director, Allegheny Conference on Community Development, and Dr. Herbert R. Domke, director, Allegheny County Health Department.

They described the industrial, civic, and social redevelopment that has accompanied effective smoke control and indicated future trends in the task of insuring cleaner air.

Continuing public and industrial support, as well as technological advances are necessary if gains are to be extended to pollutants other than smoke. Planning for the next stages requires accurate appraisal of the kind, quantity, and sources of pollutants, better techniques for control at the source, and precise, enforceable definition of control techniques in legal form in ordinances, they maintained.

Plans for control need to include the two broad categories of sources, industrial (manufacturing, service, and transportation industries) and public (automobile operation, home heating, burning trash, and other similar actions). Both types of sources, they said, contribute significantly to atmospheric contamination.

They cited R. S. Scorer's estimate that home heating and automobile and truck use caused 90.5 percent of the annual \$750 million worth of damages from air pollutants in Great Britain. This estimate, while not

directly applicable to Pittsburgh, they stated, demonstrates the need for caution in pointing to industrial sources as the principal offenders.

In Pittsburgh, the great reduction in smoke pollution from 1946 to 1959 was caused by the shift from coal to gas in heating homes and the shift from coal to diesel oil in transportation. The city's experience also demonstrates that, while total fuel consumption increased during those 13 years, smoke and dustfall have decreased.

The cost of control can be figured in dollars, the authors said, but it is sometimes difficult to put a price tag on irritation, nuisance, and property damage that result from polluted air. In Pittsburgh, heating an average home with approved fuels adds approximately \$22.75 to the yearly heating bill. Installing collection equipment in one industrial

source, an open hearth furnace, costs \$600,000, and to operate the equipment, \$100,000 a year. In Allegheny County, 12 out of 102 such furnaces have been so equipped.

Commenting on trends in air pollution control codes and ordinances, the authors noted that existing codes exhibit wide variations in the permissible smoke emission and permissible rates of discharge of solids. Some recent ordinances also specify permissible emission rate for certain types of process equipment. And some ordinances include requirements directed at specific industries, such as rendering, drycleaning, laundering, and asphalt plants.

The direct rewards of eliminating smoke are great, said the authors, but the indirect results of clean air—the restoration of civic pride, courage and determination in Pittsburgh—can be almost incalculable.

## Food and Nutrition . . .

### Dietitians Go in Where Chemists Cannot Tread

Methods of measuring what people eat, in relation to their health, were reviewed in two papers: one by Marjorie Cantoni, nutrition consultant, Dr. Ralph S. Paffenbarger, epidemiologist, and Dean E. Krueger, research analyst, all of the Public Health Service, and the other by Dr. Marjorie Grant Whiting, nutritionist, Public Health Service, and Dr. Ruth Levertov, associate director, Institute of Home Economics, U.S. Department of Agriculture.

The first dealt entirely with the nutrition phase of studies related to cardiovascular diseases. Ideally, the authors explained, the relation of diet to cardiovascular disease conditions should be appraised by lifetime studies of cohorts. Thus far methods for assessing eating habits have limited investigators to taking histories from individuals concern-

ing immediate or recent food patterns.

Such studies either test a specific hypothesis, such as the relation of fat to levels of serum lipids, or they analyze a collection of data about diet and disease in the search for possible broad associations. Comparison of the dietary habits of persons with or without clinical disease can provide only indirect evidence, and this kind of inferential reasoning comprises the epidemiological method for the study of a disease.

### Snapshot, Flashback, and Movie

Three types of comparisons are currently in use: the snapshot, flashback, and movie methods. Snapshot (cross sectional) studies compare diet of a diseased population with that of a disease-free population at a given point in time. Flashback (retrospective) studies seek information from such groups on their diets as far back as possible. Motion picture (prospective) studies follow a

### Comparison of results from concurrent calculation and analysis of weighed diets

Content	Total cases <sup>1</sup>	Extent of agreement with laboratory findings					
		10 percent below		Within 10 percent		10 percent above	
		Number	Percent	Number	Percent	Number	Percent
Calories.....	378	37	10	218	58	123	32
Protein.....	318	97	30	170	54	51	16
Fat.....	259	67	26	66	25	126	49

<sup>1</sup> Cases taken from available Canadian, British, and United States literature; a total of 31 studies.

group with specific diet habits for comparison with a group without specific diet habits, well into the future with an eye to development of pathological conditions.

In all such studies, it would be appropriate to employ standardized measurements and accurate classification of individuals as to their diet and disease status, the authors observed, with a note of regret for difficulties in obtaining ideals. But even without precise standards, they reported useful information was obtained from personal interviews and clinical observations.

The accuracy of information about diet is checked, sometimes by questioning other members of a family and sometimes by repeating the questions at other times or in other forms. Information from interviews is also compared with information obtained by recording, and sometimes weighing and analyzing, food as served. Recall of a meal, incidentally, is easier, one group of investigators has found, if the first question asks what meat was served.

#### Test Tube vs. Punchcard

Both papers commented on the difficulty of accurately appraising the nutritional composition of food intake. Reliability of dietary information was the major topic of the paper by Whiting and Leverton.

A chicken and noodle dinner, they observed, might be a delight to a gourmet, but to a nutritionist it is a big question mark. As any house-

wife knows, the relation of chicken to noodle is not constant. When such a meal is reported to a nutritionist, it is possible only to speculate how much was protein and how much was carbohydrate, how much fat was in the chicken, and the quantity and characteristics of additional fat in the total dish.

As a check on the reliability of information concerning food intake which may be reported verbally or in writing, composites representing the day's intake can be analyzed in the laboratory for nutrient content. Even this appraisal of diet by chemical analysis, they said, has its own shortcomings, apart from the cost.

Subtle chemical changes in food may occur between the time of collection and analysis. And certain combinations of food continue to defy separation into components significant to nutrition. Also, biochemical studies, it was noted, suggest that perhaps it is not the total intake that affects metabolism so much as combinations of foods and even the order in which they are consumed. Even so, laboratory analysis, they asserted, is the most reliable method of describing the nutritive value of a meal.

Tables of average food values, like all other averages, they pointed out, cover a multitude of variables. Among those they mentioned were the effects of differences due to species, season, soil, climate, storage, and processing, as well as variations in the recipe for hash.

The comparison of the two meth-

ods of analyzing diets, one obtained by laboratory analysis and the other by calculating values of weighed portions of food, was based on available studies by various investigators in Britain, Canada, and the United States. In a bare majority of the 300-odd cases, values obtained by calculation came within 10 percent of agreement with values obtained by laboratory analysis, with respect to protein and calories. With respect to fats, such agreement was achieved in only one-fourth of the cases (see table); in nearly half the cases, calculated results were higher than laboratory results by more than 10 percent. A major error in fat calculation, they believe, is that tables of food values have failed to allow sufficiently for the amount of fat which is trimmed or melted out of meat before it is served.

For epidemiological investigations, the amount of variation found between these two methods of determining nutrient value casts doubt on the significance of differences between any two studies of less than 20 percent in the intake of calories and protein and of differences of less than 30 percent in the intake of fat.

#### Food Industry Tries Self-Inspection

Within the next few years, the great majority of food operators in major cities of this country will be constructively cooperating with local health departments in establishing

and maintaining proper sanitation practices, declared Max J. Kleiner and Samuel A. Coleman, directors of the Food Sanitation Consultant Service, New York City.

However, the attainment of this objective will require sustained and continued emphasis on public health education and insistence on responsible self-inspection, they said.

Self-inspection regulations grew out of action taken some years ago by forward-looking members of the food industry who employed sanitation consultants and took part in public health measures designed to reduce insanitary practices.

Some of the self-inspection codes, drafted by city and State health departments, stress only good housekeeping. Others prescribe a full sanitation program involving education of employees; personal hygiene and food-handling practices; menu analysis and food technology, including time and temperature studies; food poisoning and quality control, including chemical and bacterial analyses; rodent and insect surveys; food storage programs; maintenance and equipment information; and standard requirements concerning ventilation, safety, and water supply and sewage in rural and suburban areas.

Kleiner and Coleman divided the food industry into three groups in evaluating the extent and quality of current compliance with regulations.

Group 1 consists largely of food chains, hotels, food processors, and the majority of large restaurants. Its members give careful attention to the self-inspection program and seek to advance it. They obtain adequate equipment, competent help with layout problems, and advance approval of health departments for their plans and practices.

Group 2 is numerically the largest but in meals served does not approach the volume of food handled by those in group 1. Members of this group do not institute their own inspection programs where no official requirement for self-inspection exists, since they consider it an

unnecessary financial burden, according to Kleiner and Coleman. Where self-inspection is required, they give token compliance, usually at lowest possible cost and with stress on housekeeping alone, Kleiner and Coleman said.

Group 3 is made up almost entirely of small and marginal operators who, according to Kleiner and Coleman, see self-inspection valuable only as a protective device to keep health department inspectors out of their establishments. Their observation of regulations usually consists of jotting a few minor items in a notebook, whether the conditions noted exist or not, and then dating their notes to appear they have made an inspection, Kleiner and Coleman charged.

## Glamorous Food Frauds

### Shade Dull Food Facts

Through plausible peddlers of pseudoscience, the public is far more influenced by misinformation about diet than by the sober truth which nutritionists and physicians have to offer, according to Dr. Martha F. Trulson, associate professor of nutrition at the Harvard School of Public Health. The money wasted

on food frauds, she said, is estimated at a billion dollars a year.

Citing examples of fraud and deception, with immeasurable effects on the family health, Trulson asserted a need for encouraging scientific authorities to provide honest information for the mass media, with or without the collaboration of professional writers.

She noted that one supermarket on the west coast employs a dietitian to answer questions about meal planning and the food values of specific products in an effort to offset misinformation notoriously rampant in that region.

Other informational steps recommended by Trulson include: appraisal of the economic and physical cost of food frauds; integration of nutritional information in various aspects of the school curriculum; basic instruction in nutrition at teacher's college and continuing guidance to teachers; publication of satisfactory textbooks on nutrition for a variety of grade levels; and utilization of nutritional information available from reputable sources, including materials available from the American Medical Association, the American Dietetic Association, the Food and Drug Administration, and the National Better Business Bureau.

# Medical Care . . .

## Medical Care Held Department Duty

Health officers were challenged by Dr. Lester Breslow, chief of the bureau of chronic diseases, California State Department of Public Health, to assume leadership in applying medical advances toward improvement of public health and to assert their competence in the field of medical care.

In voicing the challenge, he asserted that medical care has clearly become one of the most effective means to advance the health of the

people, which health officers must take into account no less than sanitation, education, and other programs. The competence of health officers in medical planning and administration, and their training and experience, suit them peculiarly for service in this field, he added.

What should the health officer do about medical care? Breslow suggested a realistic assessment of the value of medical care to public health, mentioning the analyses and examples given in the 1958 report of the chairman of the APIIA Technical Development Board as possi-

ble guidelines. He also urged health officers to seek technical advice on questions of medical economics, saying resolution of these issues will obviously influence the timing, nature, and scope of further governmental effort.

Appropriate action is the next step, Breslow continued. The aim should be to assure medical care of adequate quality and quantity to all segments of the population the health officer serves. In attaining this goal, the health officer, with epidemiological training, prevention as a traditional background, a primary interest in public health, and experience in community organization, is the ideal person to lead much needed investigation into the medical care needs of the whole population, the extent and quality of present services, and in the development and maintenance of standards.

Administrative responsibility for the expanding public medical care programs is being entrusted to agencies of State and local governments other than health departments, Breslow said in his concluding remarks, adding that the time has arrived for a critical review of the question by health officers.

## Ambulant Patient Costs Ambiguous

An evaluation of the costs of comprehensive medical care to ambulant patients reveals the ambiguities inherent in the concept of such costs, according to Dr. George G. Reader and Miss Margaret Olencki of the New York Hospital, Cornell Medical Center.

Costs are directly affected by policy, they said. If the highest level of health is sought, thorough and complete medical care may be most economical in the long run, to the extent that prevention of disease is cheaper than cure and early treatment is usually more economical than late, they explained. At the same time, the cost of thorough examination may be all out of proportion to the need, they added.

As Iago Galdston once wrote, to negative diagnosis there is no end. Moreover, a lower standard of health and care may present immediate economies which are expensive in the long run. For example, they described a patient treated summarily for an itch and epigastric pain at a cost of a few dollars, in contrast to the cost of a complete workup which might have discovered a cancerous condition.

They concluded therefore that costs depend on the level of care proposed, and the ingredients essential to a given program of care. Given these variables, they feel it is possible to determine the cost per patient or patient group.

The authors examined the charts of 719 patients, a cross section of the population of the General Medical Clinic of the New York Hospital, for 1 year. Costs of visits and services were tabulated both in terms of charges paid by the patients and expense to the hospital.

It was found that 18 percent of the patients paid nothing for services and 2 percent paid over \$100. The median cost to patients was \$13.

Only 16 percent of the patients cost the hospital less than \$10 and 11 percent incurred an expense above \$100. The median expense to the hospital was \$38.

Visits to a physician accounted for the largest single share of outpatient cost, but X-rays and laboratory tests were the most expensive items.

Cardiovascular disease and diabetes create costs above average. Patients with syphilis are the least expensive. Psychoneurosis is associated with a fairly large initial expense until serious disease is ruled out but is thereafter below average in cost.

Costs also increase with the age of the patient, more so for men than for women, but it is hard to say which factor, increasing age or certain diagnoses associated with age, contribute more to expense.

An inverse relationship was found between costs incurred and eco-

nomie status; the poorer patients incur the higher costs.

No general conclusion is warranted from these findings, the authors stated, but they feel that clues for further study are clearly discernible.

## Blues Singers Call Doctors

Psychological reactions perceived as bodily symptoms accounted for 84 percent of the initial visits to the Massachusetts General Hospital medical clinic, according to an analysis of a random sample of 101 such visits studied by doctors on the staff.

The authors, Dr. John D. Stoeckle, Dr. Gerald E. Davidson, and Dr. Jerome L. Weinberger, are all associated with Harvard Medical School as well as Massachusetts General.

This part of a continuing study of psychological factors in illness examined specifically the frequency of requests for medical care when depression following traumatic loss is present. All patients selected for study were visiting the clinic for the first time or for the first time in 1 year. They were considered ill and were referred by community physicians, by other clinics, by the emergency service, or were self-referred. All were paying patients, and no self-designated psychiatric patients were included.

Four questions were asked:

- Were symptoms related to bodily disease or was a psychological reaction presented?
- What identifiable bodily disease was present?
- What events in the patient's life preceded illness and the decision to consult a doctor?
- What were the specific psychological reactions to these events and what relationship did they have to the illness and the decision to consult a doctor?

Psychological reactions were classified as depression, hypochondriacal, obsessional, anxiety, and conversion.

More than 50 percent of both men and women had a reaction of depres-

sion. Of the 85 patients with psychological reactions, 73 reported onset of symptoms coincided with events of traumatic loss, such as separations, real or threatened bodily injury, changes in family or job status, or death. There were no differences between men and women in type or frequency of precipitating events.

Bodily disease was found in 43 percent of all patients, and in 32 percent of the patients with psychological reactions.

This proportion of somatic illness is the same as first reported from this clinic in 1905 by Richard Cabot. The authors emphasized that both organic and psychological illness occur at the same time, but the reason for coming to the clinic was most commonly psychological.

## California Physicians Sign Medical Care Contracts

The formation and operation of the San Joaquin Foundation for Medical Care were described by Mrs. Goldie Krantz, secretary of the joint welfare fund of the International Longshoremen's and Warehousemen's Union and the Pacific Maritime Association.

The 218 members of the San Joaquin Medical Society, representing 92 percent of the physicians in the county, incorporated as a foundation in 1954. Today, foundation membership includes 98 percent of the physicians in San Joaquin and two adjacent counties, Tuolumne and Stanislaus, Krantz said. The stated goals were formulation of a basis for group prepayment of medical care, an individual and family prepayment program, and the study of methods to present the desirable features of such a prepayment program to other ordinarily ineligible groups in the population. In addition, the concept was a prior countywide fee agreement based on and reflecting prevailing medical practices in the area.

The foundation is governed by a board of directors which also serves as the medical services committee of

the county medical society. Any licensed physician and member in good standing of the county medical society is eligible to apply for election to participating membership in the foundation.

Krantz said that, to assure positive acceptance by the physicians and to guard against apathy, the doctors reaffirm their membership each year by signing a contract.

The foundation, according to Krantz, uses eight insurance companies, including the California Physicians Service, to underwrite medical care programs covering 20,000 people, out of a 200,000 population. The original fee schedule has been revised by setting up three fee schedules related to the income level of a given group.

In explaining the union's decision to contract directly with the foundation for medical care, Krantz emphasized the noninsurable services given by such a program. "We worked jointly with the medical society to establish our own actuarial concepts and at the same time satisfied their moral need to use the average income of the men in the group. The foundation took the risk and, in a few instances, the losses when our educated guesses on premiums were not accurate."

In citing the advantages of medical care as supplied by the foundation, Krantz said physicians are no longer bound by actuarial concepts that may have lost their applicability. Continuity of care by referral out of the area is assured, as referrals are coordinated by the foundation.

Krantz compared the San Joaquin experience with the Kaiser Foundation Health Plan in San Francisco. Hospital days per case in San Francisco were 13.7 per man for the 1957-58 year, 7.4 in San Joaquin, an increase of 11 percent for Kaiser and a decrease of 12.5 percent for San Joaquin. Office calls per man were 3.9 for Kaiser and 3.7 for San Joaquin, a decrease of 2 percent for Kaiser and a 15 percent increase for San Joaquin.

She said there are now four founda-

tion programs operating in 14 counties in California and 6 more county medical societies have established foundations. These programs were said to vary as to local needs and reflect local practices. In some programs, patients use credit cards provided by a local banking system.

## Farmer in the Dell The Doc Picks a Doc

How does a physician select medical care for himself and his family? Dr. Milton C. Maloney, Dr. Ray E. Trussell, and Dr. Jack Elinson of Columbia University's School of Public Health and Administrative Medicine, Faculty of Medicine, reported on a survey of the behavior of practicing physicians making such a selection.

Of all professionals, physicians are chosen most frequently to make judgments with respect to standards for estimating the quality of medical care. This study was based on the assumption that their most critical judgments as to quality of care would be exercised in making choices for themselves and their families.

Personal interviews with 468 physicians, approximately 88 percent of a probability sample of all members in good standing of the Medical Society of New Jersey, were used as a source. Only 40 percent had a personal physician, although 9 out of 10 said everybody should have one. And only one-fifth, or 18 percent, had seen a physician in the past year for any reason.

Physicians, the authors stated, most often choose their family doctor from among full-time specialists in internal medicine who are diplomates of the American Board of Internal Medicine and fellows of the American College of Physicians. They usually choose him because of their knowledge of his technical competence; such knowledge is based on a long-standing personal and professional relationship.

The surgeon selected by physicians, according to the data, is highly specialized. He is usually a teacher



in a medical school; he is never a general practitioner. Most frequently chosen for his technical competence, he is a diplomate of an American Board and a member of the American College of Surgeons.

Nine out of ten anesthetists selected to give anesthesia for surgery to physicians or members of their families were also physicians. In obstetrics, three-fourths of the anesthetists were physicians.

## Puerto Rico Promotes Rural Health Parity

Disparities in the quality and quantity of health and welfare services between urban and rural areas are being reduced by an experiment in regionalization underway in Puerto Rico, according to Dr. Reinaldo A. Ferrer, regional coordinator and director of research, Puerto Rico Department of Health.

"The project is designed to develop comprehensive and coordinated curative public health and welfare services in the Bayamón region, where 768,300 people live. It is also expected that the coordinated services will give the consumer at least a 30 percent greater return than dollars used to purchase uncoordinated services," said Ferrer.

Goals of the experiment are a two-way flow of services and technical personnel between the 15 local health centers in the region and the base regional hospital in Bayamón, continuing education for all health care professionals working in the region, and the growth of technical consciousness of health and welfare needs among the region's rural and urban consumers.

Ferrer outlined the progress that has been made toward each of these goals since the regionalization scheme was started in 1956, when the Department of Health of the Commonwealth of Puerto Rico established the Regional Office for Coordination and Research.

Although legislation passed in 1947 provided for a health center in each of Puerto Rico's 72 municipal-

ities (34 have been built), and put the hospital unit (1 bed per 1,000 inhabitants) and health and welfare units under a single roof, the three units in each municipality continued to be administered independently and lacked specific standards for organization and management.

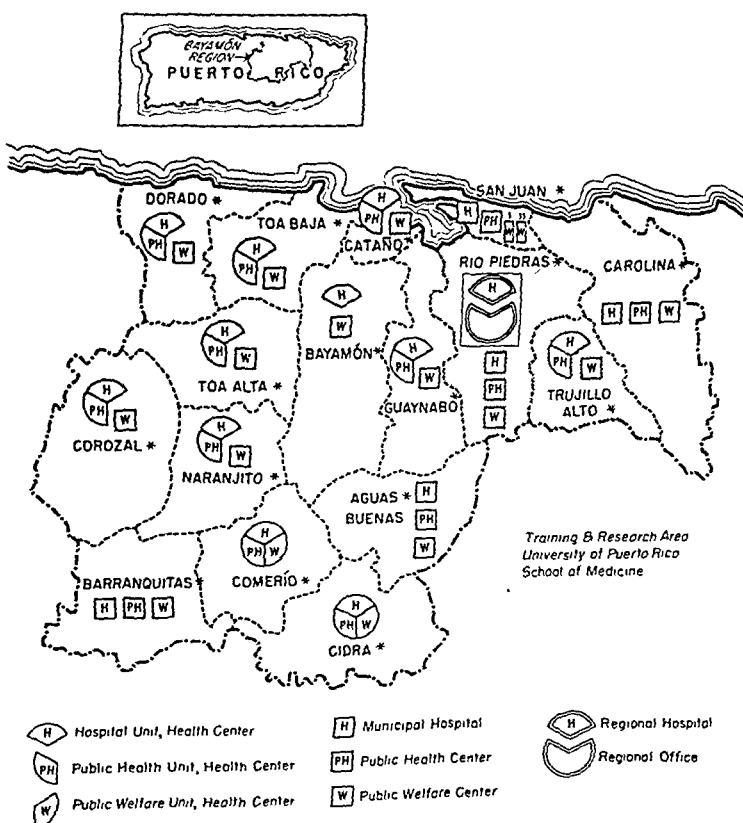
Consequently, the first task of the regional office was to compile an operating procedures manual that combined, codified, and amended the previous regulations. Standards for organization and management for each type of service within the formerly separate units also had to be prepared. Standards for 15 services have now been established, Ferrer said. "A Guide for the Opening of a New Health Center" was also found to be necessary and has been issued.

By 1958, all 15 units in the Bay-

amón region, with a proportionate number of former Commonwealth Department of Health staff, were decentralized to the regional level. Ferrer stated that the flow of services and technical personnel from the municipal centers to the regional base hospital and back to the municipality has observably reduced inequities in the health and welfare services available in rural areas of Bayamón, as compared with those available in metropolitan San Juan.

With the regionalization now in effect, chiefs of clinical services of the base hospital regularly visit the municipal centers to conduct special clinics such as pediatrics or radiology, or to perform surgical procedures. Patients now accept confidently the local center's services and no longer demand to be sent to the base hospital.

## Local health centers in the Bayamón Region, Puerto Rico



Obstacles in progress toward the second goal, continuing education for professional persons, have been financial, Ferrer noted. Consultative services by the circuit riding chiefs of clinical services have not proved a satisfactory educational tool for the local centers' physicians. Therefore, systematic graduate instruction at the base hospital on Saturday mornings and longer residencies at this hospital are being tried, but both are hampered by lack of funds to pay substitutes for the absent local physicians.

Initial steps have been taken toward the third goal, to develop a technical consciousness of the needs for health and welfare services among consumers. Creation of local health councils is being stimulated by joint efforts of the local center staffs and the research staff of the regional office. In some instances, the councils have been made advisory boards with regular meetings and increasing responsibilities.

In one municipality, the augmented council prepared evaluations of community resources and facilities, communicable disease control, maternal and child health, and environmental sanitation. They used appropriate sections of the APHA "Guide to a Community Health Study" and the evaluation schedules, adapted to Puerto Rican circumstances. Their final reports and recommendations were given to the medical director of the local center. It is planned to apply the evaluation schedules to the hospital and welfare fields, and eventually use them in community education of the need for these services throughout Puerto Rico.

## Consumer-Controlled Care Now Permitted In Ohio

Consumers may now organize and control medical care programs through closed panels or groups of physicians in Ohio, reported Glenn Wilson, manager of medical care research, Nationwide Insurance, Columbus.

Other departures from existing legislation contained in a new law effective October 1, 1959, were cited. Wilson mentioned that the range of health service offered by such a plan may now cover physicians' service in the home, office, hospital, and nursing home. Nonphysicians' hospital and nursing home care may be included, and dental care as well.

Wilson said the law provides that payments to professional personnel by the corporation may be on any terms mutually agreeable, and that large cash reserves are not initially required. Some States require as much as \$60,000 in cash to start such a program.

Broad power is given by the law to the superintendent of insurance to license and supervise medical service plans. One of Ohio's legislators, in discussing the enactment of the law, quoted Victor Hugo, "Nothing in the world is so powerful as an idea whose time has come."

## Private Patients Get Social Services

Requests for social services for private patients come more often from the patient or a relative than from the patient's physician, according to a continuing evaluation of such requests at Beth Israel Hospital in Boston. Mrs. Beatrice Phillips, director of the social service department, and Jerry A. Solon, director of the medical care studies unit, reported on this and other early findings.

Any patient, full-paying or medically indigent, may experience social and emotional effects from illness, the authors stated, and this principle led to formal arrangements extending social services to private patients at Beth Israel upon request and for a fee. Factors which may deter private patients or their doctors from requesting or using social services, they said, are lodged in traditions of medical practice, social work, hospital organization, staff relations, and general sociocultural practices and values.

Fully one-half of the requests originating with either a patient or a relative were concerned with home-maker arrangements and financial need. These difficulties, the authors observed, are only infrequently presented in requests by physicians. Requests by physicians were most frequently concerned with planning for discharge of the patient.

Requests were received in behalf of patients with a wide variety of diagnoses. Among chronic conditions, heart diseases and neoplasms predominated. Pregnancies accounted for another substantial group.

Variety also marked the length of stay of patients, which ranged from 3 to 77 days. All age levels were represented, including a noteworthy number of older patients.

Many questions are posed for this continuing analysis, the authors concluded, adding that the most basic are questions relating to how social service is evaluated by physicians and patients, and, conversely, how social workers look at giving social service to private patients.

## Extension Service Aids Rural Health

In teaching farmers good health practices, full use of the Cooperative Extension Service of the U.S. Department of Agriculture is advocated by Dr. Donald G. Hay and Dr. Evelyn J. Niederfrank, associated with the Department.

Stating that the function of the Extension Service is basically education geared to the needs and problems of people living on farms, the authors underscored the long and successful history of this Federal educational effort. They also stressed the guiding principle of extension workers, which they said has always been "helping people to help themselves."

Reflecting what the authors described as the "growing health consciousness of the American consumer," some of the increasing demands from the farm community for health services were outlined. Home

demonstration clubs ask for lessons on home care of the sick, a clinic on well-baby care, a demonstration of farm and home safety, and lessons on what to look for in selecting health insurance coverage. The 4-11 clubs want physical examination of their members, information on surveying for farm accident rates, aid in encouraging the youth of the community to use fully a poliomyelitis vaccine clinic. A farmer asks to have his dairy herd tested for brucellosis.

Physicians and dentists in private practice and public health workers were listed by the authors as key people in the Extension Service health education program. Valid information is thus channeled to rural residents. As questions are raised, the extension staff relays the queries to specialists in the field, and arranges for dissemination of the desired information to the interested groups.

Close cooperation between health care personnel, organizations and agencies, and Extension Service staffs was urged by Hay and Niederfrank. They described the existing ties between the Service and medical schools in educational leadership in health care programs, in strengthening community health services, and in community-wide efforts toward broader use of existing resources. As an example of this cooperation, the authors mentioned a project in cardiovascular disease among farmers involving Purdue University and using the Indiana Extension Service, Indiana Heart Foundation, the Indiana University Medical School, the State Board of Health, and practicing physicians. The project is focused on the work requirements and improved work methods which may be used on a farm operated by an identified cardiac worker. Possible alternative plans for organization and operation of the farm business, graded according to the physical capacity of the farmer, are planned with and not for the impaired worker, they said.

In 1959, there were full- or part-time Extension Service specialists in charge of specific health education

programs in 18 to 20 States. In 1946, there were only three.

## Fresh Concepts Outline Medical Care Patterns

The development of a conceptual framework within which various patterns of medical care can be viewed in a rational, orderly, and analytical way was reported by Jerry A. Solon, director of the medical care studies unit, Dr. Cecil G. Sheps, general director, and Dr. Sidney S. Lee, director of clinical services, Beth Israel Hospital, Boston.

In their study, supported by a Public Health Service hospital facilities research program grant, the three concentrated on the outpatient department of their hospital, but reported that the study methods are equally applicable to any medical care setting or to the population at large.

The role of the hospital outpatient department has long needed to be reappraised in the light of modern conditions, the authors said. Medical care used to consist of a simple one-to-one relationship between the patient and his doctor, but scientific specialization and growth of many varied types of care programs have made medical care much more complex today, they pointed out.

In the Beth Israel study, they sought to devise a method which would give a real sense of patterns of use and would relate the part played by the outpatient department to the total medical care of its patients.

Patients, they found, use a great many varied combinations of sources of care. Some obtain the full range of their care at Beth Israel using its outpatient clinics, the emergency unit, and occasionally ward-hospitalization. Other patients depend almost entirely upon private physicians but come to a single Beth Israel clinic for some confined purpose. Some use other hospitals and clinics. Patients continue their uses of the different sources in numerous ways.

The collection and analysis of such facts will help to reevaluate outpatient departments and assist in planning services and facilities, they said. Some key concepts of medical care patterning have emerged from the study, permitting them to obtain a sense of the person's pattern out of the maze of details. These analytical concepts enable them to:

- Delineate the patient's "current pattern of medical care," that is, the sources of care actually used during the past year and the sources he plans to use if need arises.

- Identify his "central source of care," for example, the facility or physician among these sources most important to him, or the source to which he looks for his directional signals.

- Describe the "role of his central source of care." It might be a general medical function, or a specialty service important to his well-being, perhaps a cardiologist if he is a heart patient, or a psychiatrist, or a physician-friend who may not treat the patient but will advise him.

- Finally distill from all this information what they call the person's "configuration of medical care pattern." This extracts only the essentials of his pattern of care from the whole range of his medical services.

With this framework for delineating the patients' medical care patterns, it is planned to analyze the place of the outpatient department in those patterns.

## The Streetcar Named Medical Care

Medical care for members of a union can be successfully integrated into a community health program, according to Walter J. Bierwagen, president of the Amalgamated Association of Street, Electric Railway, and Motor Coach Employees of America. He cited the experience of the Transit Employees Health and Welfare Fund, established by agreement between the D.C. Transit Sys-

tem, Inc., and the National Capitol Local Division 689 of his union, in Washington, D.C.

Prepaid comprehensive medical and surgical care and hospitalization is now given to approximately 10,000 people, the employees of the transit company and their dependents, under a contract with Group Health Association, Inc., which has been operating in the Washington area since 1937. The contract became effective April 1, 1959.

The fund, originally established by agreement between labor and management in 1952, operates under the direction of a board of six trustees, three from labor and three from management. The agreement was amended in 1956 to provide for the establishment of a union health center for medical services as well as life, sickness, disability, hospitalization, and surgical insurance coverage previously supplied by the fund.

Three major possibilities were considered: to contract for expanded Blue Cross-Blue Shield coverage; to build and operate a health center for members and their families alone; or to contract with Group Health Association. The Group Health Association was selected as the most desirable, Bierwagen said. Expanded Blue Cross-Blue Shield, he stated, offered limited medical coverage and fees were not fixed firmly. The idea of a health center for members only was given up reluctantly because of delays in giving service and difficulties in doctor recruitment.

As for the Group Health Association, a cooperative society with 22,000 members, its current facilities were strained and obviously inadequate to handle an increase of 10,000, Bierwagen said. Financing was not readily available to permit expansion of these facilities. Participants in the GHA program were concerned that the quality of medical service would deteriorate because the efforts of the existing medical staff would be diluted and newer, less experienced doctors added. Medical staff

members were concerned by the possibility of meeting board requirements in the several States from which patients are drawn.

Nevertheless, medical care service has been accomplished, according to Bierwagen, with early evidence of success as a result of a completely cooperative effort. The transit employees' fund financed a labor-management health center as an adjunct to the Group Health Association in Takoma Park, Md., at a cost of approximately \$275,000. Contract negotiations, although long and complex, have been completed. Under the contract, extra fees for special services such as X-rays, basal metabolism tests, physical therapy, blood transfusions, and the like, the so-called deterrent fees, are not charged. The union's position was that these fees depart from the basic concept of prepaid medical care.

The fund pays Group Health, Bierwagen said, \$4.18 for each beneficiary, adult or child, per month. The fund also pays all the maintenance charges for the new health center and is reimbursed by Group Health at the rate of 19 cents per fund beneficiary per month, the amount budgeted by GHA for maintenance of its health facility. An active employee with family pays the fund \$8.33 per month and management matches his contribution. Lesser contributions are made for single employees and by pensioners. Although the medical services provided pensioners and their families are the same as those given active employees, the company does not match the pensioner's contribution. The contract between the fund and GHA is initially for a 2-year period, during which time title to the labor management health center is vested in the fund. Fees and benefits will be reexamined at the end of the first year.

But Bierwagen stressed that the greatest benefit is the pattern of faith now emerging among union members which permits them to use the plan with assurance that medical care is fully prepaid.

## Health Insurance Plan Analyzes Complaints

Subscribers to the Health Insurance Plan of Greater New York, in response to encouragement from management, have been quick to voice dissatisfaction, ask questions, and make suggestions on medical service, reported George H. Weltner and Dr. Walter J. Lear, both associated with the plan.

Handling subscriber complaints against the plan's medical groups is the highly sensitive activity of the division of claims and subscriber service which Weltner directs. Dr. Lear, associate medical director, represents the medical department.

The plan is described by the authors as a non-profit, community-sponsored, insurance company supplying 550,000 subscribers with comprehensive physicians' services and, for many hospitalized patients, laboratory, X-ray, and auxiliary therapeutic services. About 1,000 general practitioners and specialists in 32 autonomous medical groups supply these services under contract, usually in their private offices.

For more than 10 years, complaints by subscribers directed to the central office of the plan have been counted and coded "with the obsessive zeal of a hypochondriac recording his symptoms," the authors stated. The rate of complaints is now fairly constant at 3 a year for each 1,000 subscribers. In the first 2 years, 1947 and 1948, this rate was eight and five respectively.

The most frequent complaints relate to the attitude of physicians (23 percent of the total) and to alleged superficial diagnosis and treatment (20 percent). Third in frequency (17 percent) is coded as "refused home call." Other complaints are "delayed or inconvenient appointments," "failure and delays in emergency service," "poor telephone service and other communications problems," and "wrong diagnosis or treatment."

Almost one-half of the complaining subscribers call a physician not

associated with the plan as a secondary action and most of these ask the plan to pay for the unauthorized call. In 1958, these instances, called complaint-claims, represented 43 percent of all complaints received, the authors said.

An analysis of 1958 complaints by the authors showed 58 percent against family doctors who provide 44 percent of the physician services; 11 percent against pediatricians, providing 12 percent of the services; and 31 percent against other specialists, providing 44 percent of the services.

### *Handling of Complaints*

Complaints to the central office of the plan average seven each working day, Weltner and Lear reported. Skillful interviewing by trained subscriber service representatives frequently eliminates the need for further action. A transfer to another family physician is sometimes useful in dispelling possible antagonisms against the plan itself.

But the complaint-claims, representing about 40 percent of all complaints received, involve requests for reimbursement, the authors emphasized, and cannot be resolved by conversation. Complete information on each complaint-claim is forwarded to the administrator of the medical group concerned. Contract stipulations, according to the authors, require each medical group to supply answering reports. Both statements (the subscriber's and the group's) are then reviewed by the medical department of the plan and the representative assigned to the case. If a solution is not found at this point, the authors said further review is made by obtaining additional evidence, the testimony of impartial specialists, or by referral to a claims committee composed of the vice president of the plan, a medical department physician, the director of claims and subscriber service, the insurance underwriter, and the plan's legal consultant.

The authors reported that 30 percent of all complaint-claims are ap-

proved, based on administrative failures, the assumption that the subscriber should be given the benefit of the doubt when evidence is mixed, and, in a few cases, a clear conviction that appropriate medical care was not given.

### *Preventing Complaints*

Thorough orientation of new subscribers lessens the higher complaint rates characteristic of the period of early adjustment of prepaid medical group practice, the authors believe. The authors described meetings held before the effective date of coverage for new subscribers and welcoming talks shortly thereafter.

Other steps in complaint prevention outlined were mailing of instructional pamphlets by the plan and a welcoming letter from the medical group which invites the new subscriber to select a family physician;

the policy of tactful interest of the subscriber service representatives in answering the questions of about 40,000 customers a year; health education meetings and bulletins; and the efforts of the individual medical groups to minimize their own complaint score.

Complaints, Weltner and Lear stated, frequently have constructive administrative results. They cited the adoption by the plan of a uniform schedule of charges for injectable drugs and biologicals after numerous subscriber complaints about variable and "excessive" charges.

The authors stated in conclusion that the voice of the patient, generally muffled in the traditional practice of medicine, is clearly heard in the plan, is recorded, played back slowly, analyzed, and often translated into practical proposals and actions.

## Public Health Nursing . . .

### Public Health Nurses Furnish Vital Facts

Despite difficulties in communication, public health nurses brought some 400 items of significant new information to the attention of the New York Hospital staff, according to Doris R. Schwartz, public health nursing coordinator.

A systematic study was made of a 50 percent random sample of referrals for public health nursing services initiated in the general medical clinic over a 1-year period, Schwartz reported. This study of 184 cases attempted to assess both the public health nurse's usefulness to patients as a result of the referral and the quality of communication in the referrals.

Information dealing with the patients' ability to function and not previously recorded in their charts was supplied by public health nurses, Schwartz said. Physical symptoms were often identified and mental or emotional problems revealed. Some

social problems reported by the public health nurse were referred to the social service department.

Health problems of other members of the household were brought to the hospital staff's attention, and many of these persons then came under the hospital's care. Observations on the impact of the patient's illness on other members of the family frequently were reflected in the physician's treatment plan.

Schwartz stated services requested were general nursing care; instruction in patient care; dressing changes, injections, or demonstrations of exercises; supportive health supervision; and evaluation of the suitability of a home situation.

In 53 cases, Schwartz recounted, 101 patients' problems with which the public health nurse might have been helpful were described in the hospital charts, but they were not mentioned in the original referral. Discrepancies were noted in 25 instances between orders written on the interagency referral and those in the chart.

Out of 87 specific requests from the public health nurses, the hospital answered 43. Although they invariably returned a written reply with other information on it, community agencies replied to the query in 67 of 83 cases, and the hospital remained without the information in 16 instances.

Schwartz described New York City's uniform referral system and the forms used. She suggested that staff education programs in both the hospital and community agencies be used to eliminate communication difficulties in the use of referral forms.

### Research Changes Prenatal Classes

More practice in the physical act of caring for babies in prenatal classes is recommended by Ethel Donny, maternal and infant care consultant, and Mabel Reid, statistician for the Visiting Nurse Service of New York.

This change in VNS classes resulted from a study, part of a 3-year project, to improve the competence of nurses in work with young parents. Questions designed to discover what the prospective parents were like, how much they learned in VNS classes, and how they adjusted to their new role as parents revealed that attendance was lightest among the least privileged.

Classes now are offered only in middle-class neighborhoods where attendance remains consistently high. They found that the women who attend classes are relatively well educated, have had little or no contact with babies, and are in close contact with their physicians.

As a result the classes provide additional opportunities for practicing baby care to supplement the individual baby-bathing practice session arranged for each mother before or after class. Parents are encouraged to diaper dolls rather than watch the nurse demonstrate different types of diapers. The feeding bottle is passed around to parents to practice its use.

The authors declared they were surprised to learn that the terminal heating method of sterilization, the only method taught in the class, was used by only half of the women who prepared formula. Now they discuss and demonstrate the aseptic method as well, stressing cleanliness but de-emphasizing sterility.

Half the women who attended classes had difficulty adjusting to their new role during their first week at home with the baby, and described it as an unhappy experience. These mothers were particularly upset by the baby's crying. The authors believe that a mother who becomes familiar with a crying baby in the hospital, while she is in a safe situation, *may not be so disturbed when her baby cries at home.*

Instead of suggesting that parents hire a housekeeper or infant attendant, VNS instructors explain the actual tasks of a new mother and encourage expectant parents to make their own plans for coping with them.

According to Donny and Reid, women who come to classes and their babies have private medical care. When mothers were interviewed between 4 and 8 weeks after delivery, the infants had already been seen by the physician an average of two times since leaving the hospital. An average of 3.4 calls had been made to the doctor for specific advice, generally concerning feeding. In deference to doctors' differences as to when solid foods are to be introduced, the authors said, they concentrate on how to do it.

Group instruction as they have developed it, Donny and Reid stated, does not attract parents from the lower socioeconomic levels or new immigrants, the families with the highest perinatal mortality. In areas where attendance was consistently low, prenatal classes have been discontinued in favor of more antepartum home nursing visits. All nursing time available for maternity work in these sections of the city is spent in home visits to encourage women to register for early prenatal care and keep their clinic appoint-

ments and to teach good nutrition and hygiene, with teaching adjusted to each mother's individual needs.

With respect to the need, they concluded that group instruction as an alternative to individual teaching, is a dubious economy in prenatal education.

### Home Nursing Lightens Chronic Illnesses

Home nursing and other health services organized for patients discharged from North Carolina Memorial Hospital in 1953 have broadened into a demonstration of unusual opportunities for limiting disability and chronic disease. This conclusion was reported by Dr. William L. Fleming, Shirley Callahan, and Dr. S. L. Warren, respectively professor, instructor, and assistant professor in the department of preventive medicine at the University of North Carolina at Chapel Hill.

Beginning with a teaching grant from the Commonwealth Fund, the home health service arranged for medical students in their fourth year to provide medical care to selected homebound patients living within 10 miles of the hospital, and bedside nursing services were arranged through the district health department.

As it became known that such home services were available, the supervising nurse of the service began to receive requests for assistance to antepartum cases. At the same time, demands increased for aid to nonmaternity cases, some of them outpatients and others on discharge from the hospital.

In light of this demand, in 1955, health officers for the State's 100 counties were asked if they could provide instructions and bedside nursing services in the homes of discharged patients, and health officers for departments covering 95 counties responded. Nearly all offered counseling services, but their estimates of availability of nursing services varied considerably.

Much of the variation resulted from their different anticipations of

the special services that might be required. In practical experience, it was found that reasonable requests for bedside nursing care have been seldom refused by a local health department.

Referrals are initiated by any professional person in the hospital, but are completed by the attending physician and coordinated by the supervising nurse.

Although most of the new referrals, in the range of 2 or 3 a day, have been maternity cases, the proportion of patients with chronic illnesses on the referral list is rising. Of 445 nonmaternity patients referred in 1958, 143 had CVR conditions, 61 diabetes, 31 paraplegia, 30 neurogenic and mental illnesses, and 28 cancer.

The percentage of referrals for home evaluation has also been increasing. For example, home evaluation is used by the pediatrics service in behalf of the nephrotic or rheumatic child.

It is believed that home evaluation can reduce failures to keep clinic appointments, disease complications, and readmissions. It also helps in planning a regimen within the patient's capacity.

The opportunity for home service at the same time makes it practical to expedite the discharge of patients with amputations, surface ulcers, colostomies, tracheostomies, strokes, and arthritis.

The authors of the report recommended that health departments not only place more emphasis on providing home nursing services but that they also should join with the community hospital in providing certain laboratory services, such as culturing streptococci, so as to assist in the correct use of antibiotics.

## Nursing Budget Uses Activity Time Data

Work measurement and performance budgeting in public health nursing are being used by the bureau of public health nursing of the Los Angeles County Health Department to

support budget requests for nursing personnel, reported its director, Olive M. Klump. These techniques have enabled the bureau to compute the anticipated volume of work to be performed at the standard which has been determined by the professional staff.

In the budget process, Klump said, health department nursing services are listed in major categories and totaled. Nursing time of all district nurses reported for each category for the period selected for study is tabulated. The total number of units in each category, divided into time consumed, gives a figure for the average time per unit.

Indirect time, Klump explained, is analyzed and tabulated into arbitrarily defined categories which include inservice training, supervision, public relations, health education, cleaning the nurse's bag, attending professional meetings, and preparing field, time, and mileage reports. Indirect time reported for all district nurses for the period studied is totaled, and a percentage ratio of the indirect to the direct time computed.

In projecting budgeted time, indirect time is added to direct time, after determining the proportion of indirect time to direct time for each district.

Data obtained in this manner have been used to indicate the number of nurses needed in each existing district, for new districts, and for new or changed programs, Klump stated. The data also bring out variations among districts. As a result, certain nursing activities are being reexamined.

Klump pointed out that quantitative appraisal of nursing services is not sufficient in itself. Services and the time allowed vary with need and conditions, and with standards of care. When only top priority home visits are made and when the time per visit is the only consideration, she said, the volume and quality of service will be inadequate.

Although the budget process is quantitative, not qualitative, Klump affirmed that it does encourage the examination of performance standards which can be used in conjunction with quantitative data.

The procedure was adapted from the field of industrial management, but it is patterned after another study in public administration in Los Angeles County, Klump declared. The procedure is practical, acceptable to management, and facilitates planning for nursing services, she concluded.

# Maternal and Child Health . . .

## Early and Cluster Testing Urged for Phenylketonuria

To wait for initial retardation symptoms suggesting phenylketonuria in infants is to wait too long; treatment must begin in early infancy to avert irreversible brain damage, asserted Dr. Willard R. Centerwall, Dr. Robert F. Chinnock, and Albert Pusavat, of the department of pediatrics in the School of Medicine of the College of Medical Evangelists, Los Angeles, Calif.

They advised screening all well babies, as in California, where health

departments participating in well-child conference testing are checking the majority of infants seen by health departments in that State.

Phenylketonuria (PKU), also known as phenylpyruvic oligophrenia, is a recessively inherited disorder in the metabolism of the amino acid, phenylalanine. It is characterized by high phenylalanine blood levels and the presence of phenylpyruvic acid (a phenylketone) and other metabolites in the urine. Infants with PKU are normal at birth, but within a few months they begin to show signs of mental

retardation; and by 2 or 3 years of age more than 90 percent of these children have progressed to the imbecile-idiot level of mental deficiency. Between 0.5 and 1 percent of the institutionalized mental defectives in this country have PKU. Interpolating from this incidence in the defective population, it is estimated that PKU probably occurs once in about 20 thousand live births. It is possible that it is even more common than this. About 200 PKU infants are born in the United States each year.

The monetary savings to the taxpayers when any such child is spared a lifetime admission to a State institution for the mentally retarded is about \$100,000 for that one child. If each such infant were to be discovered early and thus prevented from becoming mentally retarded and institutionalized, the theoretical savings to the Nation's taxpayers for only 1 year's successful detection would be in the neighborhood of \$20 million spread over the lifetime of these children.

The bulk of the report discussed technical aspects of screening and testing. On detecting phenylketonuria, they suggested, the families and physicians should be alerted to assure early diagnosis of siblings and cousins. Screening mentally deficient populations together with family orientation and sibling testing found four new cases in a recent 3-month period in southern California.

## *A Central Registry*

A central registry for phenylketonuria will encourage recognition of every case of this disease in a given area, in the opinion of Dr. Richard J. Allen, assistant professor of pediatrics, University of Michigan Medical School, Ann Arbor, Mich. He urged a cross-checking system between the family physician, the pediatric diagnostic clinic, and the State mental institutions so that all infant examinations and the evaluation of all neurologically defective children are accompanied by routine urine tests to identify phenylketonuria.

Fifteen patients were detected this way in the past 3 years in the university's pediatric department.

Efforts to detect this disease must be simple, easily interpretable, and not too costly because present statistics indicate phenylketonuria is a rare disease. Testing only infants in well-baby clinics may require many years to identify even a single case, depending on the population of that clinic. Identifying older patients has been a worthwhile study, Allen said, since the recent survey of State institutions in Michigan has detected 34 cases. Family surveys may then identify infants with the disease at an age when treatment is most effective.

In discussing testing techniques, Allen remarked that there are several sources of error, particularly when using the ferric chloride method. False negatives may result from insufficient amounts of ferric chloride added to the urine while false positives may be due to color changes associated with various drug ingestions. Some errors may be avoided by diluting the urine specimen with a large volume of distilled water before adding ferric chloride. In general, the diagnosis is easy, particularly with the commercially prepared paper strips but also with chemicals (ferric chloride solution) usually found in the physician's office.

## **Cystic Fibrosis Strains Family Resources**

The increasing numbers of children and young adults with cystic fibrosis present difficulties new not only to physicians but to their families and communities, stated Dr. Dorothy H. Andersen, department of pediatrics, Columbia University College of Physicians and Surgeons, New York City.

She explained that earlier diagnosis and informed therapy have meant prolonged life for patients with this relatively common congenital disease. Twenty years ago, most

died in infancy with malnutrition and bronchopneumonia. Andersen called the disease a public health concern and explained why the patients and their families need medical, financial, educative, and supportive help.

In cystic fibrosis of the pancreas or mucoviscidosis, many or all of the exocrine glands function abnormally. The glands chiefly affected (each in somewhat different ways) are the mucous glands of the bronchi and nasal passages, the sweat glands, and the digestive glands. The most common clinical results are chronic bronchitis, malnutrition or poor weight gain, *steatorrhea* with loss of fat-soluble vitamins, and susceptibility to heat prostration. Respiratory infection produces the most distressing symptoms and is the usual cause of death.

A physician or a clinic familiar with the disease, able to instruct the child's mother and provide continued support, must supervise the immediate care of the patient. The child needs a planned diet, daily vitamin supplements, salt tablets, and, usually, *antibiotics of some sort*.

The mother faces many questions. Are associations with other children in school and at play worth the risk of exposure to infection or is isolation of the child a greater risk? How much exercise should the child have? How should she explain the child's condition to neighbors and relatives?

The patient, as he reaches adolescence, wonders how long a life he should plan for. Should he marry? What kind of work can he do?

The financial cost of the disease, aside from hospitalization expenses, has been estimated at \$1,000 to \$1,500 a year for drugs, X-rays, trips to the clinic, and high protein foods. Families with moderate incomes sometimes deprive other members to feed the patient, and some sell their homes to pay the bills.

The genetic implications of the disease are troubling. Parents face the question of having additional children, and the present status of knowledge of the disease offers no



definite answers. The genetic pattern of cystic fibrosis is not clear, and the basic metabolic defect which is inherited is, as yet, unknown. Whether dominant or recessive, the trait is irregular in penetrance and expression. It occurs among siblings with the frequency of a recessive trait. Sex distribution is equal. Occurrence is not related to age of parents, sibling order, or economic status. It has been calculated that if cystic fibrosis is recessive, 1 in 20 of our population carries the gene, which seems improbable, according to Andersen.

Frequency of occurrence has been estimated as of the order of 1:1,000 live births. The number of living patients or the number of deaths annually from cystic fibrosis is not known. Babies Hospital in New York City sees 50-60 new cases a year, is following 250, and Boston Children's Hospital sees about 100 new cases a year. There were an estimated 2,500 hospital discharges (1 in 7 discharged by death) with this diagnosis in 1957.

For all these reasons, families feel isolated by what seems a unique dilemma. They often resent their physicians' lack of knowledge which may have delayed diagnosis and are frustrated in attempts to obtain assistance from public agencies.

Andersen suggested, in addition to more research, wider dissemination of what is known among physicians, schools, and public health agencies. Pediatricians and recent medical school graduates are best informed, but many physicians know little more than the name of the disease, she said. With informed public health centers, school nurses, and social service agencies, families with affected children might be better provided with counsel and support. Counseling services for the increasing number of adolescents and young adults would be invaluable, she said.

Some States have eased the financial burden of the disease; for example, in Connecticut the cost of drugs and vitamins is borne by the State. In many States, the laws ex-

clude patients with the disease from receiving State aid.

Additional knowledge is being sought. The Children's Bureau, Department of Health, Education, and Welfare, is studying the occurrence of the disease. The National Institutes of Health has recently established a research group. The National Cystic Fibrosis Research Foundation, organized by parents, is raising funds for research and education. Clinics in a number of children's hospitals are absorbed in the medical care of patients and in basic research.

### Lower Chloramphenicol Dose for Infants

Factors in the rising neonatal mortality rate in Baltimore in 1958 included lack of prenatal care, the possible existence of a pathological agent in hospital or community causing febrile illness in mothers, and, possibly, excess dosage of chloramphenicol in the newborn, according to a recent epidemiological study reported upon by Dr. M. Kathleen Carney, instructor in public health administration, Johns Hopkins University School of Hygiene and Public Health.

Currently, for the first time since national mortality statistics have been available, there is a nationwide rise in neonatal mortality rates. The rise in Baltimore, most marked among Negro and premature infants, began in 1957, with the rate going from 22 per 1,000 live births in the preceding year to 26 per 1,000, a difference accounting for an excess of 118 neonatal deaths in 1957. The elevation persisted in 1958 and through the first 6 months of 1959.

The Baltimore City Health Department reported that the increased mortality was limited to the neonatal period. The death rate per 1,000 live births for infants aged 28 days through 11 months remained almost stationary, and there was also no parallel rise in fetal deaths. The increase in actual number of deaths was most marked at 24 hours

through 6 days of age. There was no rise in natal day mortality. Ninety-four percent of the neonatal deaths occurred prior to the infant's initial discharge from hospital of birth. The rise was not uniformly observed in all hospitals of the city. Primarily, according to the department, it was a problem of the Negro infant.

The study was made in 1958 at two Baltimore hospitals with 50 percent of the Negro births in the city. Hospital A is the municipal hospital, in which nearly 40 percent of all Baltimore Negro babies are born. Overcrowding and understaffing exist on both obstetrical and nursery services, Carney said. Hospital B admits both private patients of staff physicians and ward patients who have been followed regularly in the hospital obstetrical clinic. It also serves as a referral agency and receives a considerable proportion of patients with complications and greater prospect of poor fetal outcome. Overcrowding is not so great here, according to Carney.

In both hospitals, obstetrical records of all mothers experiencing live births in the first 4 months of 1958 were analyzed and compared with control periods in 1956, the most recent year of significantly lower neonatal mortality. All recorded neonatal deaths during the first 9 months of 1958 were studied in detail including evaluation of all available necropsy data.

At hospital A, an increase was noted in numbers of patients failing to obtain the prenatal care offered by the city health department.

Here also was noted an increase in incidence of mothers' postpartum puerperal morbidity which may have affected the health of their infants. Data from the study concerning the incidence of fever after delivery led to the hypothesis, Carney said, that during 1958 there was possibly present in the obstetric department or community an agent (perhaps bacterial, viral, or other) which produced a febrile reaction in certain mothers in the postpartum period and may have been responsible for

the neonatal death of some of their infants. Such an agent was not detectable by routine laboratory studies performed on febrile mothers.

A change in age distribution of neonatal deaths at hospital A with an increase in proportion of infants becoming ill and dying after the first 48 hours of life led to investigations of antibiotic dosage of all infants surviving for 24 hours but dying within the neonatal period. Only two statistically significant differences in antibiotic therapy were found between 1958 and the 1956 control period, Carney reported. These involved decrease in use of streptomycin in prematures in 1958 and an increase in use of chloramphenicol in doses in excess of 50 mgm./kgm./24 hours in prematures in 1958.

The chloramphenicol dosage was of particular interest, Carney said, in light of recent reports suggesting that doses in excess of 50 mgm./kgm./24 hours might be toxic and at times fatal to small infants because of poor ability to convert and excrete it. Evidence was insufficient to be conclusive on this point, but, Carney said, "there is reason to consider this factor a lead." Since the report, the standard therapeutic dose has been altered to 20 mgm./kgm./24 hours, and coincidentally there has been a significant decrease in the mortality rates of premature infants weighing over 1,500 gm. at birth.

At hospital B, nearly 70 percent of the rise of neonatal mortality could be explained by an increase in number of immature (less than 1,000 gm.) births and deaths. This is an apparent consequence of a particular interest in the treatment of habitual aborters at this institution, Carney explained. There was no evidence to suggest any significant increase in deaths due to infection or other illness acquired in the nursery at hospital B.

## Economic Status

### Colors Birth Data

Changes in characteristics of the population of the District of Co-

lumbia, with relative gains in the low income group, clearly reveal the impact of economics on birth data, according to Dr. Ella Oppenheimer, chief of the bureau of maternal and child health, D.C. Department of Public Health.

Premature and illegitimate births and neonatal mortality have increased and prenatal care has decreased in recent years, Oppenheimer reported.

The population of the Washington metropolitan area which spills over into Maryland and Virginia has grown in both white and nonwhite components in recent years, and the relative proportions have remained relatively unchanged. However, in the District of Columbia, itself, the population pattern has altered.

The white population, which in 1950 represented 64 percent of the total, now amounts to only 47 percent of the city's total. In the same period, the nonwhite population has increased from 36 percent of the total population to 53 percent.

An important factor in this change is income. Of the nonwhite residents, 66.3 percent had incomes under \$5,000 a year, compared with 30.8 percent of the white residents. Of the nonwhite citizens, 31 percent had incomes under \$3,000 a year, compared with 11.6 of the white.

Estimates in 1957 showed 53 percent of the nonwhite and 17 percent of the white citizens unable to pay for hospital care. Even more significant of the economic status of the present childbearing population in the District, Oppenheimer pointed out, are the relative proportions of births under private medical care and hospital staff cases. Approximately 60 percent of all births to resident mothers, white and Negro, are staff cases. For the white births, between 18 and 20 percent were staff cases; for the nonwhite, more than 75 percent.

This lack of funds to pay for private physician care or hospitalization is reflected in lack of prenatal care, which in turn contributes to increases in premature births and neonatal mortality. In 1958, with

12.5 percent of the District of Columbia births premature, the percentage for those with prenatal care was 10.4 percent; for those without prenatal care, 22.7 percent. Neonatal mortality among the nonwhite portion of the population is high and increasing, Oppenheimer said.

Program action has not kept pace with the need for public services brought about by this change, Oppenheimer reported. Although the situation is now well recognized and steps are being taken to remedy it, she said, "the loss which has occurred is irretrievable."

## Social Distress

### Invites Premies

Stress occasioned by depressed socioeconomic conditions surrounding the mother may contribute to premature delivery and stillbirth, according to findings reported by Helen Wortis, instructor in psychiatry, and Dr. Alfred M. Freedman, associate professor of psychiatry, State University of New York, downstate medical center.

Wortis and Freedman drew their information from the histories of mothers of 267 premature infants (2,100 grams or less) cared for in the premature nursery at the Kings County Hospital in 10 months of 1956-57. The area served by the hospital is highly congested and is known to have a high incidence of premature births. Its population includes a large proportion of Negroes and Puerto Ricans. Of the mothers studied, 80 percent were Negro, 11 percent Puerto Rican (both white and colored but mainly white), and 9 percent white. The hospital serves only the medically indigent.

As anticipated, the mothers studied came from families of low income, 71 percent under \$4,000 a year, 18 percent under \$2,000. Twenty-three percent of the mothers had received no prenatal care; an additional 34 percent had not started such care until the third trimester of pregnancy. Although 61 percent lived in their own apartments, many

had to share kitchen or bath facilities. Thirty-five percent lived in homes where the number of persons per room was more than 1.5; 3 percent had a crowding index of 3.51-4.50.

The predominant symptom of social disorganization in this premie population was the breakdown of the family, Wortis and Freedman said. Thirty-one percent of the group studied were unmarried. Of those who were married, many were separated from their husbands. Family breakdown, moreover, was a continuing pattern, not beginning or ending with this generation. Many of the mothers had themselves spent their childhood in broken homes, and 10 of the premature infants (1 in 24 of those surviving the nursery) were refused by their mothers and discharged from the hospital to a public agency.

"It is difficult to adequately describe the quality of life histories which we elicited," Wortis and Freedman said, "For most of these women the birth of a premature child was only one traumatic event in a life experience which contained many. Their histories were so different from what we think of as an average experience in our culture that the nearest equivalents we could think of were the vagrant characters flitting through Gorky's *Lower Depths* or Caldwell's *Tobacco Road*."

### **Term Controls**

A control group, drawn from the same area and hospital, was made up of women who delivered at term during the same period and included representatives of the three ethnic groups considered. They could be presumed to come from the same social class as mothers of the prematures, Wortis and Freedman stated. Although the sample was small, no important differences were noted in place of birth, education, source of income, work status at conception, or length of time in New York.

In interviews with them, Wortis and Freedman gained the general clinical impression that these women

were less tense and upset. Two important statistical differences were noted. The mothers of term infants were older (only 10 percent under 20 years of age compared with 26.5 percent under 20 among the premie mothers), and the term mothers were more likely to have had prenatal care and to have started it earlier. Twenty-three percent of the premie mothers had had no prior medical care, while only 4 percent of the term mothers had none.

### **Conclusions**

Among the variety of causes found for premature delivery, maternal environment and social status have an important bearing, Wortis and Freedman said. "Poverty means early pregnancy, poor medical care, and broken families. In terms of individual experiences, it means an accumulation of stressful situations which must be alleviated by broad programs of social care aimed at elevating living standards and eliminating the social situations which we have observed. Better nutrition and housing, adequate financial resources, equal opportunities for education, and maintenance of family life and structure are essentials for attacking problems of premature delivery as associated with low socioeconomic status."

### **Pregnancy Losses Lower In Health Insurance Plan**

Prematurity and perinatal mortality rates were significantly lower among members of a prepaid group practice comprehensive medical care plan than among the total New York City population delivered by private physicians.

Sam Shapiro and Dr. Paul M. Denison of the Health Insurance Plan of Greater New York and Dr. Harold Jacobziner and Louis Weiner of the New York City Health Department reexamined a finding reported 2 years ago (pregnancy loss in HIP was lower than that in the general population of New York City) by

limiting their sample to patients delivered by private physicians. They also investigated the possibility that socioeconomic differentials and the greater availability of diplomates in obstetrics and gynecology in HIP account for the more favorable experiences in the medical care plan.

Comparison for 3 years (1955-57) showed that prematurity rates per 100 live births (adjusted for differences in age of mother and ethnic composition of the groups) are 3.7 for HIP and 6.2 for patients of private physicians. Adjusted perinatal mortality rates per 1,000 single live births and fetal deaths (20 weeks or more of gestation) were 23.1 for HIP and 27.9 for patients of private physicians.

According to the authors, data for 1955 showed that HIP did not have a more favorable distribution of occupations (of father) than the patients of private physicians and that, within virtually all broad occupation classes, HIP had lower prematurity and perinatal mortality rates.

The authors regarded as suggestive, but not conclusive, these two findings: to the extent that occupation of father reflects socioeconomic status, HIP's lower rates are not a consequence of this factor; perinatal mortality rates for diplomates in obstetrics and gynecology were lower than for other private physicians in the city but higher than for HIP. However, there is a possibility that diplomates in the city get more poor-risk cases than other private physicians. If so, this would affect the comparison with HIP.

Aside from the comparisons between HIP members and the patients of private physicians, the authors listed these significant findings for the entire city. Even in the highest occupation classes, only a small proportion of nonwhite and Puerto Rican women used private physicians. The stage of pregnancy when prenatal care began was affected by socioeconomic status, where the mother gets care, and ethnic group. In both white and nonwhite groups, there were major differences in pre-

maturity and perinatal mortality rates between general service (ward) cases and cases of private physicians.

The authors suggest taking a fresh look at differentials in pregnancy loss among other subgroups in New York City. They propose investigations to clarify cultural traits and attitudes of population subgroups and the influence of these attitudes on health practices prior to and during pregnancy. Also, much more needs to be known about the management of obstetrical care among patients of private physicians and about the general service cases, they said.

## Mental Retardation Needs Diagnosed

Diagnostic data on 431 "mentally retarded" children, studied at three pilot State diagnostic and parent counseling clinics and three cooperating clinics for 8 months of 1959, were presented by Bernard Ferber, associate biostatistician, and Dr. I. Jay Brightman, executive director, New York State Interdepartmental Health Resources Board.

The board was established to supply a multidiscipline approach to all health problems. Teamwork by professional disciplines is a mandate, the authors indicated, in determining needs and giving indicated services to a mentally limited child.

Tabulation of information on the 431 children revealed:

- Of the children seen, 57 percent were under 6 years of age.
- Twice as many boys were referred as girls.
- Referral sources were 32 percent, hospital or clinic; 23 percent, private physician; 15 percent, family, relative, or friend.
- No previous specialized service had been given 38 percent of the children, and relatively few had received an adequate diagnostic study.
- Ninety-three percent were accepted and completed the diagnostic workup.

• Mental retardation was diagnosed in 74 percent of the children, 13 percent were questionable, and 14 percent were classified as not mentally retarded.

• Approximately 85 percent of the services recommended were considered available, 15 percent were not.

• Of the children studied, 212 were of school age; 58 percent of

these were attending school, 42 percent were not.

• Prognosis, based on ability to function ultimately as an adult, was nil or poor for 24 percent, guarded for 52 percent, and good for 25 percent.

• Most frequent services recommended were schooling and training, and speech and hearing evaluation, including therapy and casework, and counseling.

## Dental Care . . .

### Diet Studies Explain How To Save Teeth

Two studies of diet, reported respectively by Dr. Robert L. Weiss, Public Health Service, and Margaret A. Dunham, director of nutrition, Indiana State Board of Health, both found a high association between carbohydrates and tooth decay, but with different emphases.

The study reported by Dunham found that the decay rate increased in relation to the rise in the level of carbohydrates in the diet. The Weiss study found that frequent eating of snacks between meals, preponderantly chewing gum, candy, soft drinks, pastries, and ice cream, is associated with a high def (decayed, indicated for extraction, or filled) index.

Weiss noted that modern research in dental health is guided by two hypotheses as to the relation between carbohydrates and caries. One is that the frequency of eating carbohydrates, especially foods containing sugar, influences the development of caries. Second, the consistency or chewiness of the food is an important factor.

The study under discussion examined 783 children in western Tennessee, 5 to 7 years old. Parents were asked which items of food, on a prepared list, had been eaten

by the children on the previous day, and how often they had been eaten.

Specifically, Weiss found that there was a direct and consistent relationship between the frequency of eating between meals and caries experience. As the frequency of eating between meals increased, a corresponding increase was noted in the number of def teeth per child.

Utilization of findings of this kind in dental health educational programs, Weiss said, will enhance the effectiveness of these programs. Knowledge relating to between-meal eating can be easily understood by the public and can be easily applied throughout the course of everyday living.

The Indiana study, which surveyed 222 boys and girls aged 11 to 14 in 1947, was based on a 7-day food-habit study. It also asked about the frequency of eating carbohydrate foods, as well as the total milk intake daily.

This survey found the average daily intake of carbohydrates was 34.15 teaspoons per day. The frequency was 4.9 times per day, including meals, or 1.9 between meals. The average DMF (decayed, missing, filled) rate was 3.9. Half of the students had some degree of inflammation of the gums. Average milk intake was 2.67 glasses per day.

In connection with the Indiana

study, educational efforts were aimed at recommending a good diet, with a restriction on carbohydrates, and correct cleaning of the teeth after eating.

The dental health education program in Indiana, as described by Dunham, includes a cooperative activity conducted by the State Board of Health, the Purdue University Agricultural Extension Service, and the State Dental Association.

She also described State activities for developing nutritional aspects of dental health education among professional personnel.

Inservice training programs for teachers, usually consisting of an hour's meeting at a central school in the community, begin with a platter of snacks, designed to demonstrate the attractions of food low in refined carbohydrates. Platters include apple quarters, orange sections, pineapple slices, cauliflower bits, celery stuffed with cheese and peanut butter, carrot sticks, green pepper rings, sliced raw turnips, and nuts. Teachers are also offered milk, unsweetened fruit punch, and coffee.

Food surveys are recommended to the teachers, as a means of combining research and education.

Teachers are advised to speak in the primary grades of groups of foods, rather than of specific nutrients, and to emphasize the value of citrus fruits, green leafy and yellow vegetables, and milk. Rather than advocate special courses in nutrition, it is recommended that the subject be introduced naturally in connection with the established curriculum.

Two pamphlets used widely in the program include "Nutrition and Dental Health," published by the American Dental Association, and "Smackin' Good Snacks," published by the Indiana Board of Health.

## Dental Care Approaches Needs of Aged and Ill

Several papers on the subject of dental public health explored the needs of the aged, chronically ill, and the handicapped, with respect to

patterns of care, techniques, facilities, and personnel.

### *Dovetailed Services Urged*

A plea for coordinating all dental care activities within the community for the disabled and chronically ill was offered by Dr. Marvin P. Sheldon, dental consultant of the Chronic Disease Program, Public Health Service. No single community has done this, to his knowledge.

Sheldon enumerated major conditions disabling about 5½ million noninstitutionalized persons in the country. Among typical community dental resources for them, he considers the dental society pivotal.

Hospital dental departments need expansion, he said. General hospitals give a sixth of their beds to long-term patients, but only 28 percent of all hospitals have dental services, sometimes only for exodontia or emergencies. Neither does the resident of the average nursing home of 20 beds have the dental service he badly needs.

Organized home care programs, now only 53, use dental clinics, sometimes in a hospital during special hours, or go to the patient with portable equipment. One city health department lends such equipment on appointment to members of a cooperating dental society. A portable unit including motor and arm, storage space and drawers, and working on ordinary house current is undergoing field trial, Sheldon reported.

Community dental activities should work as part of existing evaluation and diagnostic clinics, he said. These clinics give disability profiles and prognosis for medical rehabilitation and thus give a firmer base than dental treatability evaluation alone. Sources of financial aid for homebound patient projects include, according to Sheldon, existing Federal aid agreements, private philanthropy, State health and welfare funds, and nonprofit insurance companies.

### *The Kansas City Project*

Community and professional leaders, conditioned to the impor-

taunce of dental health for children, must be oriented to the value and importance of dental health to the aged and chronically ill, asserted Lewis W. Andrews, director of the Kansas City Dental Research Project, Public Health Service.

The project, established in 1957, is carried out in cooperation with Community Studies, Inc., and the University of Kansas City School of Dentistry. Health education media have assisted in acquainting the community with the purposes of the project, that is, to determine the nature and extent of dental service needs of the aged and chronically ill and problems involved in the treatment.

As a part of the project, a training program for senior dental and dental hygiene students has been established.

Personal contact with administrators of the original sample of 44 nursing homes (of a known 84) was responsible, in Andrews' opinion, for the good response. Prior recording by dental assistants of patients' medical and vital data saved time.

Three out of ten refused treatment: "My teeth will hold out as long as I will." "I don't want to be bothered." "You tend to your business and I'll take care of mine." Appointment cards for the 78 percent transported to the clinic resulted in few broken appointments. About 15 percent had home treatment and 7 percent came by ambulance. When dental care is completed, reexamination follows in 6 months. Also, new nursing home residents are added continually.

Out of a roster of 3,000 homebound chronically ill, compiled from records of voluntary health agencies, hospitals, welfare agencies, and religious organizations, 60 percent of the 964 selected were available for examination. Preplanning and organization, as in the nursing home phase, brought few refusals. About 9 percent were treated at home, 5 percent came by ambulance, and a few by their own means.

A total of 2,210 patients with an average age of 70 have received

dental examinations. Six out of ten patients examined needed and could be expected to benefit from treatment.

Cost and lack of transportation appear to be the major blocks to utilization of dental services. The dental profession is interested and willing to cooperate in dental programs for these patients.

Whether or not dentures are essential for maintaining nutrition of the edentulous chronically ill or aged patient was among criteria for measuring dental treatability of such patients outlined by Dr. Stanley Lotzkar, clinical director of the Kansas City dental project.

Other considerations are:

- The extent and duration of previous periodontal disease.
- Duration of edentulousness, patient's adaptation to it, and his probable tolerance for dentures.
- The presence of systemic disorders affecting healing, such as syphilis, diabetes, or arthritis.
- If partially edentulous, whether or not partial dentures will mean eventual loss of abutment teeth.
- Esthetic contribution to the patient's morale.

Lack of teeth sometimes seems to hasten aging, Lotzkar remarked. A patient's positive attitude can overcome numerous hurdles; but when negative, ideal conditions may not help. In treating those maladjusted to their physical disability, he advised patience, sympathy, and morale-lifting attention.

Lotzkar believes in keeping many serviceable teeth, if they are without pathology, even though the teeth may be mobile. The goal should be comfort, cleanliness, and the patient's well-being. Because of the effects of drugs such as anticoagulants, corticosteroids, and insulin, he urged consultation with physicians before surgical procedures for the chronically ill.

Since neglect of oral hygiene is widespread, dental hygienists are vital auxiliaries to dental care, including frequent prophylaxis, dental health education, and screening.

Outlining essential features for

equipment used in home dental care, Lotzkar included use of lightweight metals, better operating lights and positioning devices, a combined aspirator and air compressor, and separate units for surgical, prosthetic, operative, or periodontal treatment, in a single manageable case.

## *The Philadelphia Handicapped*

Workshops for nurses, physicians, and parents stressing the need for dental care of the handicapped in Philadelphia were cited by Dr. Manuel M. Album, lecturer in the University of Pennsylvania School of Dentistry, as a technique to combat the ignorance and apathy he feels is slowing the spread of such care.

Dentists were portrayed as both community initiators of such activities and educators of hospital, parent, or other groups interested in the handicapped. He believes that par-

ent groups, welcoming dental projects as a step toward total care, will help finance dental clinics.

Album made the point that when dental treatment of a handicapped patient is required under a general anesthetic, it be given only in the hospital and that hospital officials and attending dentist should know each other's plans and requirements. Definite hospital time must be allocated and respected, he said, adding that the dentist should know operating room techniques and procedures. All such costs in Philadelphia are covered on a semiprivate basis by a hospitalization plan, he reported, and for the indigent handicapped, by the Pennsylvania Department of Health, in hospitals it certifies. The department also underwrote tuition in courses on dentistry for the handicapped given in the University of Pennsylvania School of Dentistry.

# Epidemiology . . .

## Poison Study Indicts Careless Storage

The nature of accidents involving poisons or potential poisons among children under 5 years, tends to vary with age, it appears from an analysis prepared by Dr. Howard M. Cann, Albert P. Iskrant, and Dorothy S. Neyman, all with the Accident Prevention Program of the Public Health Service. But a high proportion of the incidents occurred with poisons outside their usual containers or places of storage.

Using information obtained since 1957 from the National Clearinghouse for Poison Control Centers, the authors reviewed more than 15,000 reports, of which 14,069 were classified as poisoning accidents. Of these, 90 percent concerned children under 5. About 60 percent of the 14,000 accidents concerned children between the ages of 1 and 3. The

highest incidence of poisonings was at age 18 to 24 months.

The younger the child, the more frequently the poison was obtained outside of its original container: for those under 1 year, about half of the poisons came from the original box or bottle. About a fourth of the 4-year-olds found the poisons outside their pristine packages.

The kitchen was the most frequent site of the incidents, accounting for 40 percent. More often than not, the chemicals were outside the customary storage place, and outside the primary package in one-fourth of the kitchen incidents. The bedroom was the next most common site.

Poisons were found most frequently on top of tables or chests, next most frequently in cabinets.

In 84 percent of the incidents, the children were presumably under parental supervision. In only 7 percent of the incidents was the child

supervised by another child, or unsupervised.

The 2-year-olds represented 30 percent of poisoning by external medications, and 46 percent of accidental poisoning by internal medication. The next highest frequency of poisoning by medication occurred among 3-year-olds.

Chemicals classed as cleaning and polishing agents, pesticides, petroleum distillates, and paints and solvents are particularly hazardous to 1-year-olds, who represent roughly half of the cases of poisoning by these commodities. The 2-year-olds swallowed these poisons more frequently than the 3-year-olds.

While children in their third year, and older, are less inclined than their juniors to swallow poisons, they show a greater preference for medications. More than half of the poison incidents in this age bracket resulted from self-administered internal medications, although they represent only a moderate share of the total cases of poisoning by medications.

On the other hand, children under 1 year represent the highest proportion of poisoning by external medications. They also claim the highest proportion of poisonings by pesticides.

Males are poison victims more frequently than females up to the age of 10 years. After the age of 15, females are the more frequent victims.

Aspirin, predominantly the so-called "baby-type," was the drug of choice in half of the incidents of poisoning by internal medication. It accounted for about 20 percent of all reported cases. No other chemical was reported to have such singular prominence.

The case fatality rate was 2.1 percent per 1,000 ingestions. For petroleum products it was 10, and pesticides 3.4.

## Habitual Drinkers Highway Hazard

Addiction to alcohol as a highway hazard was one of the factors which

led Pennsylvania's Department of Health in 1958 to set up a section on traffic epidemiology in its division of behavioral problems, according to Dr. C. L. Wilbar, Jr., State secretary of health. The medical chief of the section has undertaken to develop public health factors in the establishment of physical and mental standards for licensing of drivers. In this connection, he is acquiring data on the influence of alcohol on driving ability and studying records of accident repeaters.

Although alcohol in the bloodstream of a driver, passenger, or pedestrian has been incriminated as a major factor in highway injuries and deaths, Dr. Wilbar remarked that punitive and educational activities seem not to have been effective in discouraging the mobile drinker.

The literature available on the subject, slender though it is, he said, indicates that the habitual alcoholic rather than the casual drinker is the major offender. In confirmation of this conclusion, he said, of 241 patients treated for alcoholism in a State mental hospital in Pennsylvania, 12 within 4 years before admission were convicted of driving under the influence of alcohol. As a percentage, these alcoholics had 17 times as many such convictions as the general population of drivers.

Restriction of licensing, rather than revocation, he said, is the recommended policy for regulation.

In preparing drivers' licensing standards for the State department of revenue, the health department has enlisted support of subcommittees of the State medical society, dealing with general medicine, cardiovascular diseases, neurologic disorders, visual standards, auditory standards, orthopedic standards, mental health, and drugs and chemicals. These categories were employed originally in a New York University symposium on accident prevention in December 1956.

Other sources of reference used included the American Medical Association guide on determining fitness to drive a motor vehicle, and testimony before the Subcommittee

on Traffic Safety, Committee on Interstate and Foreign Commerce of the House of Representatives of the 84th Congress, 1956. Except for certain psychological recommendations still under development, and certain standards for vision, the recommendations of the medical society have been approved in principle. Different standards apply to passenger transport operators, commercial operators, and private automobile drivers. Physical examinations for drivers are recommended on application and thereafter at the ages of 30, 40, 50, 60, and every 5 years thereafter.

## Skin Radiation Reappraised

Fifty board-certified dermatologists collaborated in a survey organized by Dr. David Goe Welton, Charlotte, N.C., and Prof. Bernard Greenberg, School of Public Health, University of North Carolina, in a 1958 study of the use of ionizing radiation for treatment of skin conditions.

With records of 27,000 visits by patients, it was learned that ionizing radiation was used to treat almost a fourth of the conditions diagnosed. The 12 diagnoses most often treated by radiation were keloid, anogenital pruritis, neurodermatitis anogenital, other localized neurodermatitis, eczematoid dermatitis, dyshidrosis, epithelioma, chronic dermatitis venenata, fungus infections, psoriasis, all types of acne, and herpes zoster. Radiation uses increase gradually with the age of the patient.

A rather consistent uniformity of opinion was found as to the specific diagnoses for which radiation therapy should be used. The number of these conditions is considerably less than it was 10 years ago.

It was concluded that the selective use of radiation and the application of devices for increased protection of the patient support the belief that "there is no threat to the public health" from the use of ionizing radiation by dermatologists.

## Toxoplasmosis Prefers Man to Mouse

The sea around us, according to Don Eyles, Public Health Service scientist, may be toxoplasmosis, perhaps the most frequent parasitic infection of this world.

Although widespread in man and many other warm-blooded animals, only in the last generation has human toxoplasmosis been recognized. Most adults carry antibodies which

probably indicate prior experience with the infection. Eyles said there is little reason to doubt the specificity of the dye test which supports this estimate of prevalence.

Nevertheless, the mode or modes of transmission of the parasite, a protozoan of uncertain affinities which grows intracellularly in a variety of tissues, is unknown. Infections are usually benign, he said, but are occasionally severe and even fatal.

The only epidemiological charac-

teristics of the disease suggested by Eyles apply to temperature, moisture, and family. No clear-cut economic, social, or environmental factor has been established, however.

Eyles suspects that studies of animals may provide the best clues to the disease. For example, he mentioned cats as having a high prevalence, whereas laboratory mice, which are quite susceptible to the parasite, rarely have spontaneous infections.

## Seasonings and Flavorings Safe for Use

Safety clearance of most of the natural seasonings and flavorings that the housewife uses in her kitchen and of many others that go into her packaged foods was provided in a food additives regulation issued by the Food and Drug Administration in January 1960. More than 150 naturally derived seasonings and flavorings are listed as safe for use in food on the basis of the findings of qualified experts throughout the country.

Cinnamon, cloves, nutmeg, thyme, and vanilla, are included as well as those familiar to the gourmet or the commercial food processor such as coriander, mace, savory, and extracts of balsam of Peru, spike lavender, wild cherry bark, and ylang-ylang.

The list was developed from the comments of food scientists on an original list of natural flavors published in the April 21, 1959, Federal Register. Manufacturers who use these flavors need not furnish further proof of their safety.

Information on safe usages for seven flavoring substances is not sufficiently well established among qualified experts to permit a formal determination by the Food and Drug

Administration that they are "generally recognized as safe." These are quinine, red and yellow cinchona barks from which quinine is derived (all three are used in so-called "tonic" carbonated water), two forms of orris root (having minor food use as a supplemental flavor), and wintergreen and methyl salicylate (chemically identical forms of the same flavor).

Wintergreen and methyl salicylate have been used in confectionery for many years and there is no evidence that the very small amount required to flavor candy is hazardous. However, the agency has deferred a determination on their safe use until additional data from current laboratory studies of methyl salicylate are available, possibly in a year. Meanwhile, action will not be taken against candy or other foods flavored with methyl salicylate or oil of wintergreen in the amounts customarily used for these substances.

Concerning quinine, cinchona, and orris as flavorings, it is expected that levels of safe usage will be established by regulations issued in response to petitions from interested users.



# Signs

and

# Symptoms

## *of trends in public health*

Alcoholics employed in the transportation industry as locomotive engineers, as pilots, or as truck or bus drivers are a public hazard, says Dr. Marvin A. Block, in an editorial in the *Journal of the American Medical Association*, August 29, 1959. He recommends cooperative efforts by labor, management, and medical societies to exclude heavy drinkers from these and other positions where inaccurate or faulty judgment due to alcohol endangers the lives of passengers.

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Only 42 days of eye irritation due to smog in the first 8 months of 1959 were reported from Los Angeles County compared with 51 days in the comparative period of 1958, and 61 days in 1957, although the weather in 1959 was more conducive to smog than in the past. County supervisor Warren M. Dorn feels that current control measures account for the improvement. However, air pollution experts agree that significant gains cannot be achieved until control of automobile exhaust fumes is possible.

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"You're on your own if a national emergency occurs" warned Dr. Caruth J. Wagner, acting as spokesman at a recent joint meeting of the Disaster Medical Care Committee of the American Medical Association and the Division of Health Mobilization of the Public Health Service.

Survival after a thermonuclear attack would depend upon the individual's ability to take care of himself for a period anywhere from 18 hours to 2 weeks, Dr. Wagner said. "Everyone should know how to per-

form lifesaving measures to stop bleeding, give artificial respiration, and treat shock," he continued, adding that people must also know how to assure themselves and their families of safe water and food supplies, general nursing care, and personal shelter and sanitation facilities.

The AMA committee requested the meeting as part of a series of briefing sessions being scheduled throughout the United States. Dr. Wagner is chief of the Division of Health Mobilization, Public Health Service, which was established May 1, 1959, for the purpose of investigating the health and medical needs of the Nation in time of emergency and directing a program to meet these needs. He explained that his statements were premised on the capabilities of modern weapons to cause millions of casualties and to completely disrupt all materials and facilities involved in day-to-day living.

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Career opportunities in health were brought to the attention of high school and college students, guidance advisers, and parents last November in Pennsylvania.

The project was co-sponsored by the Pennsylvania Department of Health, Pennsylvania Medical Society and its auxiliary, the Pennsyl-

vania Public Health Association, the Pennsylvania Health Council, and other State and local health agencies.

Governor David L. Lawrence signed a proclamation. News articles, television spots, and radio announcements were distributed to all newspapers, and television and radio stations. Community activities included panel discussions at school assembly programs, community meetings, and parent-teacher association meetings; distribution of printed materials; announcements during school sports events; tours through hospitals, water supply systems, and health centers; reports in school newspapers; and the formation of health career clubs.

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In the Soviet Union, one-half of the engineering students and one-third of the scientists and engineers are women.

Only about 8 percent of all of the scientists and engineers in the United States are women and 85 percent of them are concentrated in the three fields of biology, chemistry, and psychology.

These figures were cited by Betty Lou Raskin, research associate with the Johns Hopkins University radiation laboratory, in urging more encouragement and acceptance by Americans of women in science.

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Professional nurses from every State and Puerto Rico received Federal aid during the past 3 years for advanced training for administrative, supervisory, and teaching positions, the Public Health Service has announced. A total of 3,803 have benefited.

Slightly more than half the trainees each year were preparing for teaching positions, both in schools of professional nursing and schools of practical nursing. About one-fourth were studying for positions in administration, and the remaining one-fourth for supervisory posts.

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Carbon monoxide from the stacks of a steel mill in Weirton, W. Va., last September hospitalized 13 persons a block away.

# Poliomyelitis Immunization House to House

WILLIAM A. ALLEN, M.P.H., AND MICHAEL J. BURKE, M.A.

**W**HAT results can be obtained by a house-to-house poliomyelitis campaign among "hard-to-reach" groups?

This question had been raised a number of times by staff members of the Philadelphia Department of Public Health. When in the summer of 1959 it appeared that immunization was lagging in sections of the city where poliomyelitis incidence was highest, it was decided to conduct a house-to-house program through the use of four mobile teams.

A number of extensive immunization programs had been conducted in prior years in Philadelphia. As in many other communities throughout the country, the poliomyelitis immunization program was initiated in April 1955, as soon as the Salk vaccine was released.

The first phase was directed toward inoculating children in the first and second grades of public, parochial, and private schools. From the inception of this program, there was excellent cooperation between the Philadelphia Department of Public Health and the medical divisions of the public and parochial schools.

Every year since 1955, the schools have conducted intensive inoculation programs with vaccine furnished by the health department. Age restrictions were gradually modified so that, eventually, the immunizations were made available to children in all grades. The health department provided the personnel for the administration of the parochial school program. The public schools, however, supplied their own personnel for their program.

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*Mr. Allen is director of the division of health education and Mr. Burke, statistical epidemiologist, Philadelphia Department of Public Health.*

All vaccine used by the schools in 1955, 1956, and 1957 was supplied by the health department either through its own budget or by allocation from Federal or State sources. In 1958 and 1959, however, in addition to the city supply, the Philadelphia Chapter of the National Foundation gave the department 100,000 cc. of vaccine, some of which was used by the schools. In the spring of 1959, the public schools purchased additional vaccine for their use.

In the summer of 1956, again with the cooperation of the schools, the health department organized 10 teams, 1 in each of the 10 health districts into which the city is divided. These teams moved from one school to another each day. They inoculated 110,000 children. The teams worked in 113 public and parochial schools immunizing children under 15 years of age and expectant mothers. By working through the schools to bring the program to the people in their neighborhoods, great numbers of previously unvaccinated persons were reached. At the same time, daily inoculations were given in the health centers.

In 1957 the health department, the Hospital Council, and the Philadelphia County Medical Society jointly conducted inoculation clinics in 10 private hospitals strategically located throughout the city. These clinics were held on 4 Saturdays selected so that an individual could receive at least two inoculations.

Members of the county medical society volunteered their services to staff the clinics. Volunteer clerical workers from the local chapter of the National Foundation and hospital and health department personnel completed the clinic staffs. During this phase of the program, which provided immunizations for persons 40

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In the Soviet Union, one-half of the engineering students and one-third of the scientists and engineers are women.

Only about 8 percent of all of the scientists and engineers in the United States are women and 85 percent of them are concentrated in the three fields of biology, chemistry, and psychology.

These figures were cited by Betty Lou Raskin, research associate with the Johns Hopkins University radiation laboratory, in urging more encouragement and acceptance by Americans of women in science.

» »

Professional nurses from every State and Puerto Rico received Federal aid during the past 3 years for advanced training for administrative, supervisory, and teaching positions, the Public Health Service has announced. A total of 3,803 have benefited.

Slightly more than half the trainees each year were preparing for teaching positions, both in schools of professional nursing and schools of practical nursing. About one-fourth were studying for positions in administration, and the remaining one-fourth for supervisory posts.

» »

Carbon monoxide from the stacks of a steel mill in Weirton, W. Va., last September hospitalized 13 persons a block away.



A crowd forms around a team giving inoculations on a Philadelphia street corner

trucks toured the neighborhoods announcing the free inoculations in the clinics. All of these efforts were directed at getting residents to come to the established clinics.

Because of the wide variety in the backgrounds of residents of the city including economic, cultural, and ethnic differences, a number of different motivational approaches were used, especially among the "hard-to-reach" groups.

Within a few weeks it was evident that this program, aimed at providing free inoculations to children under 7 years of age and expectant mothers, was lagging despite the intensive efforts to encourage residents to participate.

With the poliomyelitis season approaching

and realization that the "hard core area" had not been reached adequately, plans were made to bring the program to the people through the use of mobile teams operating on a door-to-door basis in districts 5 and 6.

Several planning meetings of representatives from public health nursing, epidemiology, health education, and other divisions were held to pave the way for the kickoff of the new program.

Four teams were organized to work in these districts. The teams traveled in station wagons which were equipped with vaccines, syringes, and other supplies. Banners announcing the free injections were prominently displayed on the vehicles, and loudspeakers were mounted on

years of age and under, almost 75,000 persons were inoculated.

On the first Saturdays of February and March 1958, inoculations were offered at 10 public and parochial school sites to persons through 40 years of age. Vaccine, as well as a number of volunteer workers, was supplied by the local chapter of the National Foundation. Most of the staff, however, came from the health department. Because inclement weather limited the total number immunized to less than 40,000, the health department had a large amount of unused vaccine. The department made it available to universities, colleges, seminaries, professional schools, and technical and vocational schools.

In the summer of 1958, daily inoculation sessions were held in district health centers for all persons 40 years of age and under. Night sessions for persons in these age groups were conducted during August, September, and October.

In all of these programs the department noted that the response was poorest in areas of the city having the lowest economic standards and the most congested living conditions.

Since 1955, Salk vaccine has been distributed upon request to hospitals for their prenatal and pediatric clinics. In 1959, for example, vaccine was distributed to 36 hospitals and to private physicians for the inoculation of their patients who could not afford the cost of the vaccine. The hospitals and the physicians were required to submit a form for each inoculation administered.

Despite all efforts to raise the immunization level of the city to a satisfactory level, 77 cases of poliomyelitis, including 2 deaths, occurred in 1958. This represented a sharp rise over the previous year and was the greatest number of cases recorded in the city since pre-Salk days. In 1954, there had been 228 cases. The number of cases in 1955 was 42, and in 1956 the number declined to 16. In 1957, only 10 cases were recorded in the city.

Of the 77 cases which occurred in 1958, 39 cases, or 50.7 percent, were in health districts 5 and 6, which had an attack rate of 9.1 per 100,000 population. In comparison, the remainder of the city had 38 cases, or 49.3 percent, an attack rate of 2.1 per 100,000. The overall attack rate for Philadelphia was 3.5 per 100,000 population.

Late in 1958, the department reviewed the effectiveness of the various immunization programs which had been undertaken. Based upon statistical data gathered from school programs, special programs, and district clinics, estimates were made regarding the general immunization status of the city. It became apparent that additional efforts were needed to motivate residents in health districts 5 and 6 to protect their children and themselves against poliomyelitis and to prevent the possible development of an epidemic in the city.

Districts 5 and 6 are bounded by the Delaware and Schuylkill Rivers and extend from Vine Street on the south to Lehigh Avenue on the north. They are characterized by substandard housing, low incomes, and a greater incidence of other diseases such as tuberculosis and venereal disease. These districts also have a higher infant mortality rate than the city as a whole and many other social and economic ills.

Because of the apparent failure to gain response in these districts to the previous inoculation campaigns and the upsurge of poliomyelitis incidence in 1958, most of which occurred in this area, the health department decided to direct its attention to methods aimed at the "hard-to-reach" groups.

Accordingly, early in 1959 special methods were used. Thousands of specially designed leaflets and posters were distributed, volunteers visited homes in the neighborhoods, and sound



Mobile teams traveled in loudspeaker-equipped station wagons, which also carried supplies

In the actual operation, a team sometimes proceeded along a particular street, stopping often to give injections. Frequently, however, it was more advantageous to park the vehicle for long periods and administer the vaccine from a strategically situated parking lot or street corner.

During the 10 weeks that the program was in operation, 37,879 individuals were inoculated. Of this number, 21,326, or 56.3 percent, received their first inoculation; 7,297, or 19.3 percent, their second; 5,348, or 14.1 percent, their third; and 3,908, or 10.3 percent, their fourth. By age distribution, 12,363, or 32.6 percent, were under 7 years of age; 6,777 or 17.9 percent were 7 through 14 years; 1,823 or 4.8 percent were 15 through 18 years; and 16,916 or 44.7 percent were 19 years of age or older.

Since more than 75 percent of the inoculations were given to preschoolers and to persons more than 19 years of age, the program was effective in reaching susceptible age groups as well as groups in which the immunization level was considered to be extremely low.

Although it is felt that the house-to-house approach was successful in immunizing many people who would not otherwise have been reached, several disappointments were encountered. During the campaign, eight cases of paralytic poliomyelitis and one nonparalytic case occurred in Philadelphia, all of them in health districts 5 and 6 where the mobile teams were operating. The fourth, fifth, sixth, seventh, and eighth cases occurred almost within the shadows of the mobile units. None of the persons with the disease had availed themselves of the vaccine.

The success of the campaign, however, is indicated by the fact that the incidence of polio-



### . . . and in New York City

Two mobile clinics began giving free poliomyelitis inoculations in August 1959. The clinics, set up in trucks loaned by the city's civil defense office, operated from 1 to 6 p.m. for 10 weeks and moved to a new location each day. *Above:* At 125th Street and Lenox Avenue health department staff members register those to be vaccinated. *Right:* Harlem children wearing sandwich boards help to publicize the clinic's visit in their neighborhood.



*At the district health center the teams laid final plans for the evening's operations*

the roofs. Personnel for each team consisted of a physician to give the injections, a public health nurse to go from door to door to tell residents about the availability of the inoculations and to answer questions, a graduate nurse to fill syringes and assist the physicians, a health educator to organize in advance and coordinate a volunteer corps to assist in the home visits, a clerk to register persons requesting inoculations, and a disease control investigator or sanitarian to drive the station wagon and to make announcements over the loudspeaker.

The local chapter of the National Foundation supplied funds to rent sound equipment and produce the tape recordings which were used in addition to live announcements. A well-known soft drink company provided containers to refrigerate vaccine, and a sound equipment company provided additional loudspeakers.

The newly constructed health center in district 6 was selected as headquarters for the program. This center has an excellent physical plant with adequate storage facilities. It has a large parking lot which permits easy loading of vehicles, and in addition, it is convenient to

good transportation facilities to all parts of the city, which facilitated the travel of personnel staffing the program.

The house-to-house program was initiated July 6 and continued through September 1. Hours of operation were between 5:30 and 7:30 p.m., Mondays through Fridays. Because teams continued to work until everyone wishing an injection had been immunized, the teams frequently did not return to the headquarters until 9 p.m.

In order to speed the registration procedure, no forms were filled out for adults. For children under 21, it was requested that parents complete a parental consent form. When parents were unable to come to the mobile unit, children were given a parental consent form and were immunized when they returned the completed forms.

When the house-to-house program began, immunizations were offered only to children under 7 years of age and expectant mothers. Because of the difficulty of limiting the inoculations to this age group, the program was expanded to provide immunizations for persons of all ages.

# *Transport* of Streptococci on Filter Paper Strips

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**P**ROBABLY the most prevalent bacterial pharyngitis of humans today is that caused by beta hemolytic streptococci of group A. The clinical diagnosis of such an upper respiratory infection, although reasonably good in some instances (1), depends on a clinical picture which is not characteristic in all age groups (2, 3). Adjunct laboratory aid, by isolation of the causative organism, is therefore valuable in determining and evaluating therapy and its duration and is a necessity for intelligent control and prophylaxis. The latter measures apply not only to the streptococcal infection, but even more importantly, to the nonsuppurative sequelae of rheumatic fever (4) and acute diffuse glomerulonephritis (5).

Procedures for isolating bacteria are not available to the average physician or to health officers in some areas. Even when these pro-

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myelitis in Philadelphia in 1959 was approximately 73 percent under the incidence for 1958. For the Nation as a whole the incidence of poliomyelitis was up almost 42 percent in 1959.

It seems evident that the house-to-house approach, by providing immunizations for "hard-to-reach" groups in their neighborhoods, played a prominent part in cutting the toll of poliomyelitis in Philadelphia.

### Summary and Conclusions

Since 1955 when the Salk vaccine was released, the Philadelphia Department of Public Health has conducted a continuing poliomyelitis immunization program which has had a number of different phases. Cooperating in these various phases have been the public and parochial schools, the Philadelphia County Medical Society, the hospitals, and the local chapter of the National Foundation.

During the program, many of the well-established techniques to motivate residents to become inoculated were used. The department staff noted that, although response to various phases of the program was great in many higher income areas of the city, the response in certain of the lower income, highly congested areas was almost invariably poor.

Although the incidence of poliomyelitis was relatively low in 1955, 1956, and 1957, an upsurge of the disease occurred in 1958 when there were 77 cases, including 2 deaths. An analysis of the immunization situation made by the department staff late in 1958 led to the conclusion

that a renewed effort was required to increase participation in the program among the residents in health districts 5 and 6, the area in which most of the 1958 victims lived.

A special program was instituted early in 1959 to encourage the groups most susceptible to poliomyelitis to become immunized at the regular health department clinics in districts 5 and 6.

When this program lagged in the spring of the year, the health department staff, realizing that adequate immunization had not been gained and faced with the threat of a possible epidemic or outbreak, organized a special house-to-house immunization campaign in which mobile teams toured the neighborhoods in health districts 5 and 6 for a 10-week period, July 6 through September 11.

During this effort, 37,879 persons were immunized. The results of the house-to-house campaign revealed that this type of direct approach, particularly to groups which do not respond to the usual approaches, can be of great value in increasing participation in immunization programs. Of the people responding to the campaign, the majority were in the age groups most susceptible to poliomyelitis and in which the immunization level was particularly low.

Detailed planning and close cooperation of all health department organizational units, as well as close cooperation with groups in the community, are essential in any program of this type.

### Kurlander, Assistant Surgeon General

Arnold B. Kurlander, M.D., formerly deputy chief of the Bureau of Medical Services, Public Health Service, has been named Assistant Surgeon General. He will assist the Surgeon General on current program matters, facilitate communications between the four bureaus of the Service and the Surgeon General's office, and expedite the handling of program aspects of operating problems.

blood agar (fig. 1) which was incubated immediately at 37° C. and designated as the control culture by source laboratory W, X, or Z.

The other swab was streaked heavily back and forth onto a filter paper strip in an opened kit as described (6,7). The strip was air dried 3-5 minutes before the kit was refolded, placed in a Manila envelope, and mailed or transported to a receiving laboratory, *p*, *q*, *r*, or *s*. Two of the source laboratories in California also acted as receivers. The other receiving laboratories were in Georgia and Maryland.

After 2-10 days the filter paper strip was removed from the kit and plated (fig. 2), except for strips which were plated after 5 to 21 days by receiver *s*. In plating, the FPS was removed from the kit and placed inoculum side down on the blood agar surface without prior treatment of any kind. Before the plate was inverted for incubation, the plated strip was inspected to see that it had absorbed moisture from the medium. Any part of the strip which was dry was pressed gently against the surface of the agar until it appeared wet. After 6 hours' incubation at 37° C., the filter paper strip was removed from the primary plate and placed inoculum side down on a second or replica plate. Both replica and primary plates then were incubated 18 hours at 37° C., making a total of 24 hours for the primary plate.

The visual reading was then made with the strips removed so that isolates could be picked. If the growth was heavy, only the primary plate had discrete beta hemolytic colonies, the replica plate having confluent lysis. Occasionally, if growth was very light the primary plate had no lysis, but this finding was exceedingly rare. Plating was on 10 percent defibrinated sheep blood agar in laboratories *p* and *r* and on 3-5 percent defibrinated rabbit blood agar in laboratories *q* and *s*. Three of the laboratories were relatively unfamiliar with the FPS technique.

Cultures from paired swabs were designated by number. In order to eliminate bias, the controls and filter paper strips were matched as pairs only after final reports were received. Each of the four receiving laboratories was sent 34 inoculated FPS kits by each of three source laboratories, 408 in all. Eight kits were reported lost, leaving 400 paired cultures in the

study. Of each set of 34 kits, 17 were estimated to be negative and 17 positive on the basis of preliminary visual reading of the control cultures at the source laboratory.

From all positive cultures (control and filter paper strip) isolates were identified by serologic grouping (9). At two laboratories (*q* and *s*) grouping was done with antisera from the Communicable Disease Center, Public Health Service, Chamblee, Ga. All other grouping was done by laboratory *r* with antisera from a biological supply company (Difco).

Two statistical estimates on pooled data are presented, the difference between two proportions and twice the standard error of the difference between these proportions. The difference between the two proportions is considered significant only if it is more than twice the standard error (10).

#### Recovery by Streptococcal Group

Group A streptococci were isolated from control cultures and cultures of filter paper strips.

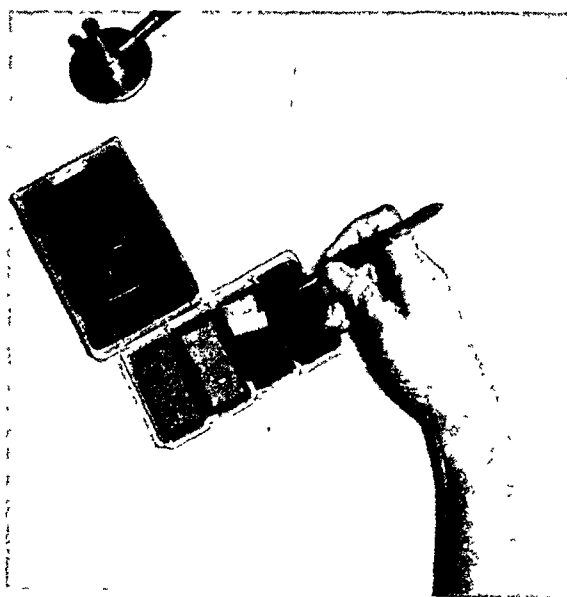


Figure 2. Plating a filter paper strip

The filter paper strip is placed, inoculum side down, on the surface of the blood agar medium. The strip absorbs moisture from the medium and is plated directly upon removal from the kit without treatment of any kind.

cedures are available, methods of transporting pharyngeal materials to a laboratory are cumbersome and do not always assure the arrival of viable bacteria. To obviate some of these difficulties, a method for mail transport of throat swabbings on sterile filter paper in enclosed kits was recently developed (6). The method appears reliable for use in the diagnosis of group A streptococcal infection: beta hemolytic streptococci, 80 percent of which were of group A (7, 8), were recovered by culture after 2 to 10 days in transit on the filter paper strips (FPS). The results of testing more than 2,500 children compared favorably with those obtained from immediate culturing, by usual techniques, of simultaneous paired control swabs.

The present study was made to test further the FPS method for reliability, reproducibility, effects of transport distance, and other factors on the isolation of beta hemolytic streptococci from pharyngeal swabs.

### Clinical Material

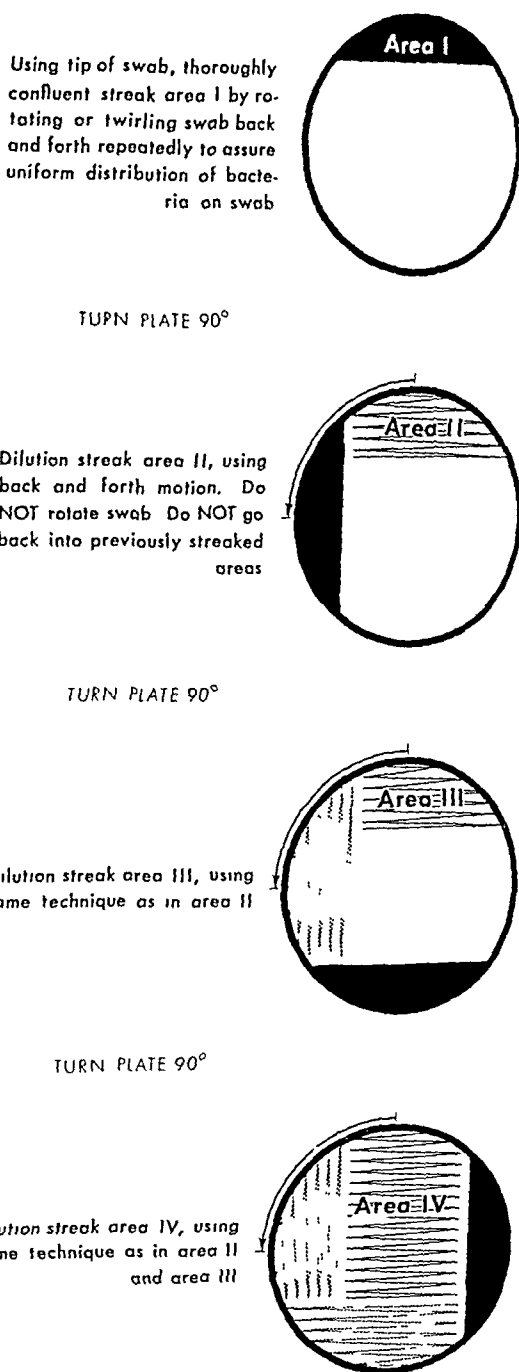
A total of 400 paired throat swabbings were supplied by three source laboratories, W, X, and Z, located in California. Laboratories W and X obtained 264 of the paired swabbings from patients in the closed population groups at a private pediatrics office, at the outpatient pediatrics clinics, and in a cooperating county health department (7).

The remaining paired swabbings were supplied from a field trial in which more than 500 paired throat cultures were obtained from children or their parents in less than 3 hours. This field trial was conducted at an open county clinic during a 1-day Salk vaccine inoculation program. The microbiologists on temporary assignment from laboratory Z found that the 500 paired cultures were not obtained by the method proposed and the filter paper strips were not air dried 3-5 minutes. Of these 500, the first 136 controls and the paired filter paper strips are reported for comparison with data obtained by the proposed method.

### Methods

To obtain paired throat cultures, simultaneous swabbing was employed. Two throat swabs

Figure 1. Method of streaking blood agar plate



were held in one hand and thoroughly rotated over the pharynx of the patient, care being taken to obtain an entirely satisfactory specimen. Without delay, one swab was dilution streaked onto 10 percent defibrinated sheep

Table 2. Number of isolations of streptococci by group in relation to holding and transit time

Number of days FPS held	Group A isolations			Groups B, C, and G isolations		
	Controls positive	FPS positive		Controls positive	FPS positive	
		Number	Percent		Number	Percent
1.....	0	0	-----	0	0	-----
2.....	7	6	86	1	0	0
3.....	10	8	80	3	2	67
4.....	10	10	100	5	5	100
5.....	4	3	75	5	3	60
6.....	32	30	94	30	15	50
7.....	12	15	125	3	3	100
8.....	6	6	100	2	2	100
9.....	3	6	200	1	0	0
10.....	4	3	75	1	1	100
Total 2-10 days.....	88	87	99	51	30	59
11.....	5	4	80	2	0	0
12.....	4	4	100	2	1	50
13.....	1	1	100	0	0	-----
14.....	2	2	100	0	0	-----
15.....	4	1	25	9	0	0
16.....	1	1	100	0	0	-----
17.....	1	0	0	3	1	33
Total 2-17 days.....	106	100	94	67	33	49

<sup>1</sup> Includes one nongroupable strain.

<sup>2</sup> No growth for one set of 34 kits, paired with controls having 3 group A and 9 B, C, or G isolates.

miles or less from the source laboratories in California. Agreement for group A isolates was 86-100 percent among all receivers (*p*, *q*, *r*, *s*) and all sources (*W*, *X*, *Z*), percentage estimates being based on the total negative controls. For negative controls, percentage figures below 100 percent indicate that group A streptococci were isolated from the matched filter paper strip cultures. For positive group A controls, laboratories receiving FPS from sources *W* and *X* were in approximate agreement, with a record of 74-86 percent recovery (table 3). This 74 to 86 percent range in percentage recovery is no greater than would be anticipated from prior investigations of throat flora (11,12). In the investigations cited, variability was so great that it was deemed impossible quantitatively to interpret the growth on throat cultures.

In contrast to the agreement with sources *W* and *X*, the percentage agreement for positive group A controls varied from 0 to 91 percent among laboratories receiving FPS from source *Z*. These filter paper strips were not

obtained under the conditions described for the study nor were they air dried. The set of 34 kits sent receiver *q* had no paired positive controls, the set sent receiver *p* was estimated to consist only of positives, and the 34 kits sent receiver *s* showed no growth when the FPS were plated at 15 days, or 5 days after the designated holding period of 2-10 days.

There was remarkably close agreement (100 isolations from filter paper strips, 106 isolations from controls) in the recovery of group A streptococci, regardless of holding time, source, location of receiver, and previous use of the technique (tables 1 and 2).

Groups B, C, and G beta hemolytic streptococci, on the other hand, apparently have been recovered in significantly greater percentages from the control than from FPS cultures (tables 1 and 2), but inspection of the data results in reservation of an opinion. Within group C, only about 25 percent and within group B or G only about 40 percent of the streptococci isolated were from filter paper strip cultures (table 1). However, a review of

The percentage recovery was the same, although controls were plated at once from throat swabbings, while inoculated FPS were in transit or were held 2-17 days prior to culturing. Of the 206 group A strains recovered, 106, or 52 percent, were from controls, and 100, or 48 percent, were from filter paper strips (table 1). Basing the percentage estimate for group A on the 400 cultures reported by receiving laboratories, recovery was 25 percent from FPS and 26.5 percent from controls. These percentages are not different; on pooled data the difference between proportions equaled 0.015, and twice the standard error equaled 0.062.

The transit and holding period prior to culture of the 100 filter paper strips from which

group A streptococci were isolated was 2-17 days (table 2). Within the designated parameters (2-10 days holding time) of the study, 87 group A streptococci were isolated from FPS and 88 from control cultures plated immediately, a striking record. Due to the small numbers plated each day and to the finding that one set of 34 filter paper strips had no growth on culture after a transit and holding period of 15 days, statistical estimates are not considered valid for percentage recovery based on a single day or on time periods beyond the anticipated 2-10 days before plating (table 2).

The percentages in table 3 show that group A streptococci survived equally as well when the FPS were shipped 2,500 or 3,000 miles into Maryland or Georgia as when shipped 400

Table 1. Number of positive cultures, controls and paired filter paper strips, by streptococcal group

Streptococcal group and receiver	Source W		Source X		Source Z		Total controls	Total FPS	Total
	Controls	FPS	Controls	FPS	Controls	FPS			
<b>Group A</b>									
p-----	12	9	12	17	11	12	35	38	73
q-----	11	8	8	8	0	3	19	19	38
r-----	14	12	5	7	8	2	27	21	48
s-----	10	11	12	11	3	0	25	22	47
Total-----	47	40	37	43	22	17	106	100	206
Percent-----							52	48	100
<b>Group B</b>									
p-----	1	1	0	1	3	0	4	2	6
q-----	2	3	1	0	0	0	3	3	6
r-----	0	0	0	0	0	0	0	0	0
s-----	0	0	0	0	1	0	1	0	1
Total-----	3	4	1	1	4	0	8	5	13
Percent-----							61	39	100
<b>Group C</b>									
p-----	3	2	1	1	7	1	11	4	15
q-----	3	1	1	2	0	0	4	3	7
r-----	1	0	4	1	7	3	12	4	16
s-----	2	0	0	0	6	0	8	0	8
Total-----	9	3	6	4	20	4	35	11	46
Percent-----							76	24	100
<b>Group G</b>									
p-----	1	0	1	1	4	4	6	5	11
q-----	1	1	0	0	0	0	1	1	2
r-----	2	3	4	2	2	2	8	7	15
s-----	5	2	2	1	2	0	9	3	12
Total-----	9	6	7	4	8	6	24	16	40
Percent-----							60	40	100
<b>All groups</b>	68	53	51	53	54	27	173	133	306

<sup>1</sup> Includes one nongroupable strain.

Table 4. Number of negative and positive cultures for beta hemolytic streptococci by source and receiver

Source and receiver	Total paired specimens <sup>1</sup>	Negative		Positive	
		Control	FPS	Control	FPS
<i>Source W</i>					
<i>p</i> -----	34	17	22	17	12
<i>q</i> -----	34	17	21	17	13
<i>r</i> -----	34	17	19	17	15
<i>s</i> -----	34	17	21	17	13
<i>Source X</i>					
<i>p</i> -----	34	20	14	14	20
<i>q</i> -----	30	20	19	10	<sup>2</sup> 11
<i>r</i> -----	33	20	23	13	10
<i>s</i> -----	31	17	19	14	12
Total-----	264	145	158	119	<sup>2</sup> 106
Percent-----	100	55	60	45	<sup>2</sup> 40
<i>Source Z</i>					
<i>p</i> -----	34	9	17	25	17
<i>q</i> -----	34	34	31	0	3
<i>r</i> -----	34	17	27	17	7
<i>s</i> -----	34	22	<sup>3</sup> 34	12	0
Total-----	136	82	<sup>3</sup> 109	54	27
Percent-----	100	60	<sup>3</sup> 80	40	20
Total W, X, and Z-----	400	227	<sup>3</sup> 267	173	<sup>2</sup> 133
Percent-----	100	57	<sup>3</sup> 67	43	<sup>2</sup> 33

<sup>1</sup> The total of the paired specimens equals the sum of the negative and the positive controls.

<sup>2</sup> Includes one nongroupable strain.

<sup>3</sup> No growth from one set of 34 kits, FPS plated at 15 days.

### Moisture, Drying Surface, and Temperature

Two previous studies indicate that a greater number of recoveries of beta hemolytic streptococci can be obtained upon culturing filter paper strips, air dried after inoculation with these organisms in throat swabbings, than can be made from similarly inoculated strips which are not air dried before a 2-10 day transport period (6,7). In these two studies the effect of temperature was not explored.

Working in Zurich, a team of three investigators (13) found recovery of *Streptococcus pyogenes* following drying was improved if the relative humidity was very low or zero. A room temperature of 20° C. favored recovery, whereas temperatures of 30° and 37° C. decreased the colony count on culture following drying. The three investigators demonstrated that, after drying, 10 to 80 times as many streptococci remained on a glass coverslip as were washed free by 4 minutes of shaking followed by 10 minutes of soaking in the rinse water. This difficulty in removal of organisms from glass is comparable

to removal from cotton (14). The successful use of filter paper strips for transport of streptococci is in conformity with the finding that viability and recovery of streptococci depend not only on drying but on inoculating on a rough surface and culturing the transport material itself rather than streaking or rinsing it (13).

Further documentation of the successful recovery of group A streptococci from filter paper strips, upon culture after a 2-10 day transit and holding period, is unnecessary. The equivalence of control and FPS techniques is evident in all group A tabulations.

### Summary

The filter paper strip technique for transport and holding of throat swabbings for subsequent culture of beta hemolytic streptococci further was tested by investigators in five collaborating laboratories. Of these five, located in Georgia, Maryland, and California, the three

the original records shows that 46 percent (31 of 67) of all the FPS paired with groups B, C, and G positive controls were from source Z and were not air dried. For this reason tabulation by holding time before plating does not yield additional useful information on these groups (table 2). Insufficient data were obtained in the study to support a valid conclusion on the efficiency of the filter paper strip technique for use in recovery of group B, C, or G streptococci. Additional study is warranted.

### Recovery by Source and Receiver

*Sources W, X, and Z.* Of all paired cultures 57 percent, or 227, were negative controls and 43 percent, or 173, were positive controls (table 4). There were 306 positive isolates, of which 33 percent, or 133, were from cultures of filter paper strips. This is significantly less than the percentage of positive controls (difference between proportions on pooled data equaled 0.100 and twice the standard error equaled 0.067). Interpretation of this difference is complicated by conditions which obtained at source Z.

The pattern of agreement of reports on

matched filter paper strip and control cultures for the entire study (table 5) is somewhat similar to the pattern of agreement of group A isolation (table 3). For the entire study there is 81-100 percent agreement for FPS reports matched with negative controls. The 81 percent indicates that 7 of the filter paper strips from which positive cultures were obtained were matched with negative controls (sources W and X, receiver *p*, table 5).

*Sources W and X compared with Z.* For positive controls the percentage agreement was equivalent for sources W and X regardless of receiver (74-81 percent), but this is not the case for source Z (0-64 percent, table 5). There is no difference between the percentage of positive isolates from air dried filter paper strips (40 percent) and from controls (45 percent, table 4, sources W and X). The difference between proportions on pooled data equaled 0.05 and twice the standard error equaled 0.086.

There is a difference in recovery if the inoculated FPS are not air dried. For instance, from source Z percentage recovery from strips is only half that from positive controls, 20 and 40 percent respectively (table 4).

**Table 3. Isolation of group A beta hemolytic streptococci from filter paper strips and controls by source and receiver**

Source and receiver	Negative controls <sup>1</sup>				Positive controls <sup>2</sup>			
	Negative FPS	Positive FPS	Total	Percent agreement	Positive FPS	Negative FPS	Total	Percent agreement
<i>Sources W and X</i>								
<i>p</i> -----	38	6	44	86	20	4	24	83
<i>q</i> -----	43	2	45	96	14	5	19	74
<i>r</i> -----	45	3	48	94	16	3	19	84
<i>s</i> -----	40	3	43	93	19	3	22	86
Total-----	166	14	180	92	69	15	84	82
<i>Source Z</i>								
<i>p</i> -----	21	2	23	91	10	1	11	91
<i>q</i> -----	31	3	34	91	0	0	0	-----
<i>r</i> -----	26	0	26	100	6	8	8	25
<i>s</i> -----	31	0	31	100	3	3	3	30
Total-----	109	5	114	96	12	10	22	55
Total W, X, and Z--	275	19	294	94	81	25	106	76

<sup>1</sup> Negative controls=no streptococci isolated or streptococci other than group A.

<sup>2</sup> Positive controls=group A streptococci isolated.

<sup>3</sup> No growth.

fects of high humidity or high temperature air drying is essential, even if a longer period is required, but air drying will not insure satisfactory recovery of streptococci if the swabbing is unsatisfactory.

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### Use of Heptachlor on Crops Banned

The use of the pesticide heptachlor under conditions which leave residues on harvested crops was prohibited on January 19, 1960, by the Food and Drug Administration, through the rescinding of a regulation permitting small residues on harvested food and forage shipped interstate.

New scientific data have shown that in addition to residues of heptachlor, a breakdown product, called heptachlor epoxide, is present after heptachlor treatments, and that residues of epoxide appear in meat and milk when forage containing it is fed to experimental meat and dairy animals. No residues of heptachlor itself have been found in meat or milk. How much epoxide may be present under varying conditions and the toxicity of the substance have not been determined. No action will be taken against crops already treated within previous regulations.



**Table 5. Isolation of beta hemolytic streptococci from filter paper strips and controls by source and receiver**

Source and receiver	Negative controls				Positive controls			
	Negative FPS	Positive FPS	Total	Percent agreement	Positive FPS	Negative FPS	Total	Percent agreement
<i>Sources W and X</i>								
<i>p</i> -----	30	7	37	81	25	6	31	81
<i>q</i> -----	34	3	37	92	21	6	27	78
<i>r</i> -----	35	2	37	95	23	7	30	77
<i>s</i> -----	32	2	34	94	23	8	31	74
Total-----	131	14	145	90	92	27	119	77
<i>Source Z</i>								
<i>p</i> -----	8	1	9	89	16	9	25	64
<i>q</i> -----	31	3	34	91	0	0	0	41
<i>r</i> -----	17	0	17	100	7	10	17	40
<i>s</i> -----	22	0	22	100	0	12	12	0
Total-----	78	4	82	95	23	31	54	43
Total W, X, and Z--	209	18	227	92	115	58	173	66

<sup>1</sup> Includes one nongroupable strain.

<sup>2</sup> No growth.

in California served as source laboratories. Using two swabs for simultaneous swabbing on each patient, each source laboratory immediately inoculated a control culture and a paired FPS. Each source sent a set of 34 inoculated filter paper strips to each of four receiving laboratories. Of the FPS in each set, one-half were estimated to be positive on the basis of preliminary reading of controls. In all, 400 filter paper strips were received and held for variable time periods. From both controls and filter paper strips 306 strains of beta hemolytic streptococci were isolated, 305 of which were groupable. The findings were tabulated by streptococcal group, percentage agreement by positive and negative controls, and by source and receiver as well as by time held prior to plating.

The filter paper strip technique proved to be highly satisfactory for transport and holding of group A streptococci. Of the 206 strains of group A streptococci isolated, 106 were from controls and 100 were from FPS. This record of recovery, 52 percent from controls plated at once and 48 percent from filter paper strips held or in transit 2-17 days before culture, is

remarkable in view of the geographic distribution of receiving laboratories and the fact that three of four receiving laboratories were relatively unfamiliar with the technique. For group A isolates, source and receiver achieved equally good percentage agreement with respect to negative controls and to recovery from filter paper strips air dried after inoculation.

Data on percentage recovery of groups B, C, and G streptococci by the filter paper strip technique are inconclusive. Half of the FPS paired with controls positive for B, C, or G were not air dried and one-sixth were plated at time intervals beyond the 2-10 day period designated for the study. Of 100 B, C, and G isolates, 33 percent were from FPS and 67 percent from controls. Any conclusion as to recovery is complicated by the conditions which obtained for those filter paper strips cultured and matched with controls positive for these groups of beta hemolytic streptococci, and additional studies are warranted.

Attention is directed to the necessity for adhering strictly to the described technique for throat swabbing and for handling filter paper strips. Because of the possible deleterious ef-

# Diagnosis of Streptococcal Infections

It has been estimated that about 2 million people living in the United States today have already had, or will develop, rheumatic fever at some time during their lives. Of these, more than 500,000 will probably die because of the rheumatic process or some complication developing directly from it.

Rheumatic fever most often strikes children between the ages of 5 and 15, and the resulting rheumatic heart disease causes about 50 percent of all heart disease in this age group. It is estimated that in the 5- to 19-year age group in this country there is a current annual incidence of about 60,000 cases of rheumatic fever. About half of these are recurrences, and the remainder are first attacks. It is the recurrent attacks of the fever which cause the actual damage to the heart itself.

While the past 40 years have shown a marked reduction in rheumatic fever mortality, the problem is far from solved. In 1957, rheumatic fever and rheumatic heart disease combined to cause the deaths of about 20,000 in the United States. However, by the application of what is currently known about these diseases, some real progress has been made.

What causes rheumatic fever is not fully understood, but research has shown that cases usually begin with a streptococcal infection—primarily of the throat. The specific pathogen has been identified as group A beta hemolytic streptococci.

Antibiotics can eliminate streptococci, and effective prophylaxis can prevent the secondary attacks of rheumatic fever. Indeed, penicillin prophylaxis appears to be accelerating the decline of rheumatic fever.

First attacks of rheumatic fever can be prevented through prompt treatment of streptococcal infection which entails the use of an antibiotic (preferably penicillin) for a period of 10 days. But therein lies the physician's dilemma. A "strep throat" cannot always be

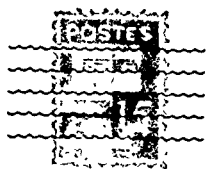
distinguished clinically from sore throats caused by other organisms, but every "strep throat" is a potential case of rheumatic fever.

Since there are many objections to indiscriminate penicillin therapy, the physician usually considers it advisable to delay treatment for 2 to 3 days until the causative agent can be identified by a throat culture. He is repeatedly forced to decide whether to postpone treatment until a definite diagnosis is made, and perhaps save the patient some money, as well as lower the risk of a future penicillin sensitivity, or to treat the infection with penicillin immediately on the chance that it is "strep."

To date, prevention of the first attack has been almost impossible to achieve, since there was no quick, certain way for the physician to identify streptococci. Now the fluorescent antibody technique has provided a means for overcoming this obstacle.

The fluorescent antibody test works this way: Antibodies for a specific disease are stained with a fluorescent dye and then dropped onto a slide which has been smeared with material taken from the patient whose disease is to be diagnosed. If the smear contains a germ for which the antibody is specific, the antibody will immediately attach itself to the germ. When the liquid containing the antibody is washed off the slide, the antibody and the germ will remain, and, under ultraviolet illumination, a greenish fluorescence resembling minute neon lights will show up on the slide. If the germ is not present in the specimen, the antibody will wash off the slide along with the liquid that contained it.

The use of the technique by State laboratories as a diagnostic aid to physicians must necessarily be a gradual, natural growth. Lack of trained personnel is only one of many problems connected with initiating such a service program in a State or community. Other difficulties involve submission and transportation



# INTERNATIONAL MAIL POUCH

## ***Regionalization in Paraguay***

The 7-month course to train auxiliary nurses in Encarnación was the first fruit of our efforts to demonstrate regionalization. It was the first full-time training for health personnel ever offered outside the capital of Paraguay. The 16 students will complete 1,050 hours of instruction and supervised practice. This is to be a permanent program with one such group being prepared in Asunción, the capital, and other groups in three regional health centers.

—ROBERT T. SCHOLES, M.D., *chief, health and sanitation division, U.S. Operations Mission, Paraguay.*

## ***Cost Cutting***

Mounted on motorcycles, two sanitary inspectors did the work of five by completing in 7 months their routine inspections as well as special survey work over an area of 2,000 square kilometers of Surinam. The motorcycles cost about half the salary of a single inspector.

—ROBERT BREWER, *former acting sanitary engineer, U.S. Operations Mission, Surinam.*

## ***Santa Teresa***

The new health center in Santa Teresa, Nicaragua, has sparked civic improvements. Even before all the equipment was installed, other changes were planned: a new marketplace and park, and improved water supply and garbage disposal systems. The mayor, the village priest, and the school authorities are most cooperative, and the villagers themselves are enthusiastic.

The staff of the Santa Teresa center and the second new center in Diriá were given an orientation course since some of them are inexperienced in this kind of health work. Their responsibilities are

heavy because they are the only medical units in that part of Nicaragua. They designed a basic medical data form which was used to gather information house-to-house in the two communities. The survey's results will serve as a baseline for evaluating the effectiveness of the rural health centers.

Perhaps the most important task they face is to *reduce the incidence of infestations of intestinal parasites*. Of the first 100 people examined at the Santa Teresa center, 98 were found to be infected, some with as many as four different varieties of parasites. Gastroenteritis is the principal cause of death in Nicaragua.

The supervising sanitarian, with the sanitary engineer consultant and the Ministry of Public Health, worked out a plan for this rural area's excreta disposal. Sanitary latrines combined with the education efforts of the center's staff is expected to show definite results shortly.

—PATRICK J. SULLIVAN, *former chief, and MAHLON H. HAWORTH, former business manager, health and sanitation division, U.S. Operations Mission, Nicaragua.*

## ***Promotion***

One of our graduates has become sanitary foreman of the main construction camp of the Brokopondo dam project in Surinam. Two and a half years ago he started to work for us as a day laborer and his technical skill was limited to handtools and driving a car.

After working with the sanitary engineer, he can use a slide rule like an expert, perform chemical and bacterial tests for water treatment, assemble portable purification plants, and put into operation a complete water treatment plant as well as training its staff.

—ROBERT BREWER, *former acting sanitary engineer, U.S. Operations Mission, Surinam.*

*Overweight children usually become overweight adults, according to a study, spanning 20 years, of 200 residents of Hagerstown, Md.*

## Relationship of Excess Weight in Children and Adults

SIDNEY ABRAHAM and MARIE NORDSIECK

**T**HE ADVERSE effects of obesity upon health have been reported in life insurance and epidemiological studies (1-4). These reports have prompted investigators to employ various remedial methods and approaches to obesity (5-9).

The department of nutrition of the Harvard School of Public Health evaluated two approaches to weight control programs: individual counseling and group therapy (10). A 3-year followup showed that a majority of the 147 subjects failed either to reduce or to maintain a reduced weight. Stunkard and McLaren-Hume reviewed the literature of the past 30 years on results of treatment for obesity and found the results to be "remarkably poor" (11). Their own efforts with a group of outpatients were not successful in either reducing weight or maintaining a reduced weight for 2 years after treatment.

Young and others also reported the lack of success in a weight control program, but suggested the importance of childhood excess weight status as one of the factors determining adult excess weight status and of subsequent problems in weight control (12). They found that relative success was achieved in overcoming obesity when it was a recent development in the adult years. Mullin also reported,

in a retrospective study, on the role of childhood obesity in adult obesity (13). He suggested that a persistent childhood obesity is reflected in a large proportion of adult obesity.

Height-weight data on school children examined some 20 years ago in Hagerstown, Washington County, Md., by the U.S. Public Health Service, presented an opportunity for a prospective study of the relationship of the weight status of individuals in childhood and adult years. Previous observations suggesting a relationship between childhood and adult obesity have been based primarily on retrospective studies of obese adults who have been interviewed about the history of their weight status. Childhood heights and weights on record in the Hagerstown sample supplied data that did not rely on memory for testing the hypothesis that obese children tend to become obese adults.

### Method

Physical examinations of school children in three elementary schools in Hagerstown were performed during the years 1937-39. These

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*Mr. Abraham is a statistician and Miss Nordsieck, program adviser in the Heart Disease Control Branch, Division of Special Health Services, Public Health Service.*

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## Coons Receives Lasker Award

A major contributor to progress in public health, Dr. Albert Coons was presented with the Lasker Award at the 1959 meeting of the American Public Health Association in Atlantic City, N.J., in October.

Dr. Coons developed the fluorescent antibody test in the early 1940's with associates at the Harvard School of Medicine, where he is continuing studies along these lines. He has been a career investigator with the American Heart Association since 1953.

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of specimens from the physician's office to the laboratory, a system for reporting the results back to the physician, and the maximum number of tests that can be performed by a single technician in any given period. In addition, the necessary equipment—the ultraviolet light source, filters, and special microscope—is relatively expensive and not in plentiful, immediate supply.

Through the following actions, however, the

Public Health Service is helping to extend the use of the test as rapidly as possible:

- Local personnel have been trained by the Communicable Disease Center and equipment left on indefinite loan in the areas that participated in the field tests.

- About 40 Public Health Service physicians assigned to State and local health departments held a special meeting in Philadelphia on October 27, 1959, to determine the best ways in which they could help health departments, medical societies, and heart associations throughout the country to take advantage of the new research avenues which the fast strep test has opened.

- A 2-week training course for laboratory personnel of 12 State health departments was held at the Communicable Disease Center in January 1960.

- Materials and equipment will be lent to laboratories as soon as they have personnel trained to use them.

- Financial assistance is provided through grants from the National Heart Institute for research projects and through State grants-in-aid for purchase of equipment.

## Influenza Research Promoted by PHS Committee

Influenza research was encouraged by a meeting January 13, 1960, of the Public Health Service Committee of Investigators, composed of leading authorities on influenza and related diseases.

Committee members agreed to accelerate their own research during 1960 and to encourage long-range studies. All influenza research projects will receive special review at the National Institutes of Health and qualified projects will be approved rapidly.

Among subjects the committee cited as needing study were:

- Assessment of the value of vaccine given in the 1957 epidemic as to its possible degree of protection.

- The present degree of immunity of unvaccinated persons who had influenza in 1957.

- The physiological effects of influenza on cardiovascular and respiratory systems.

- The neuromuscular effects of influenza.

The Committee of Investigators was established on the recommendation of the Surgeon General's Advisory Committee on Influenza Research.

Members of the Committee of Investigators are: Dr. Robert Wagner, University of Pennsylvania, chairman; Dr. George Burch, Tulane University; Dr. Fred M. Davenport and Dr. Thomas Francis, University of Michigan; Dr. Ivan Bennett, Johns Hopkins University; Dr. George Hirst, Public Health Research Institute of the City of New York, Inc.; Dr. Maxwell Finland, Boston City Hospital; and Dr. Roderrick Murray, National Institutes of Health, Public Health Service.

**Table 2. Distribution of relative weight of school population and of study group, 10-13 years of age, by major weight category, Hagerstown, Md., 1937-39**

Relative weight	Boys		Girls	
	School population	Study group	School population	Study group
Total.....	977	100	966	100
Below average (less than 95).....	320	0	435	0
Average (95-104).....	425	50	290	50
Overweight, total.....	232	50	241	50
105-119.....	193	13	171	0
120-129.....	14	13	29	12
130-139.....	16	16	21	20
140-149.....	5	5	9	7
150 and over.....	14	3	11	11

<sup>1</sup> 1 in this weight category not sought due to inadequate records.

<sup>2</sup> 2 in this weight category not sought due to inadequate records.

and 7 because they were not available for interviewing.

Each interviewer carried a measuring stick and a portable scale for height and weight measures. Weight status was measured in terms of relative weight, computed as the percentage deviation of actual weight from average weight for a given height, age, and sex. Average weights were obtained from height-weight tables in the Medico-Actuarial mortality

investigations of 1912 (18) and distributed by the Metropolitan Life Insurance Company. (Revised tables of average weights were a part of the "1959 Build and Blood Pressure Study," recently published by the Society of Actuaries (see p. 266). Publication followed preparation of this paper. An analysis, using these more recent figures, revealed no noteworthy change in the results obtained.)

Distribution for relative weights of adults was not available, but 20 percent or more above average weight was defined as marked overweight (1). Average weight was calculated in a manner similar to that for children whose relative weight values ranged from 95 through 104.

Average age of adults was 31 years. For men, ages ranged from 27 to 36 years, for women, from 26 to 35 years.

Of the 28 interviews with average weight men, 26 were used in the study and 2 for pretesting. One interview with an average weight woman was used for pretesting; all other interviews, a total of 29, were used in the study.

Interviews with 32 overweight men were used in the study and 2 were used for pretesting. Twenty-seven interviews with overweight women were used in the study and one was used in pretesting.

No bias was introduced by attrition since childhood weight status of those who were not interviewed did not differ from those who were. The statistical notes analyze the differences

**Table 3. Result of followup of study group, by childhood weight status**

Results	Total population		Men				Women			
			Average		Overweight		Average		Overweight	
	Number	Percent	Number	Percent	Number	Percent	Number	Percent	Number	Percent
Total.....	200	100	50	100	50	100	50	100	50	100
Located.....	174	87	45	90	42	84	41	82	46	92
Interviewed.....	120	60	28	56	34	68	30	60	28	56
Located but not interviewed.....	54	27	17	34	8	16	11	22	18	36
Out of county.....	47		13		7		10		17	
Not available for interview.....	7		4		1		1		1	
Cannot locate.....	23		4		6		9		4	
Died.....	3		1		2		0		0	

records, containing height-weight data, are on file in the Public Health Service office in Hagerstown (14). Physical measurement data are available on 977 of the 1,201 boys and 966 of the 1,152 girls examined at ages 10 through 13 years. Cohorts were selected on the basis of available serial height-weight data.

The examiners measured heights without shoes. At the weighing, the children removed shoes, sweaters, or coats, but retained usual indoor clothing.

**Table 1. Distribution of relative weight of school children 10-13 years of age in 3 schools in Hagerstown, Md., 1937-39**

Relative weight	Boys		Girls	
	Number	Per- cent	Number	Per- cent
Total.....	977	100. 0	966	100. 0
60-69.....	0	0	1	0. 1
70-79.....	3	. 4	18	1. 9
80-89.....	120	12. 3	207	21. 4
90-99.....	453	46. 6	387	40. 1
100-109.....	279	28. 6	202	20. 9
110-119.....	80	8. 2	81	8. 4
120-129.....	14	1. 4	29	3. 0
130-139.....	16	1. 6	21	2. 2
140-149.....	5	. 5	9	. 9
150 and over...	4	. 4	11	1. 1

The weight status of each child was determined by using a relative weight method, defined as the percentage deviation of actual weight from the average weight for a given sex, age, and height. Average weights were obtained from the Baldwin-Wood height-weight tables (15). The distribution of these relative weights is shown in table 1.

Studies of the relationship of obesity to health and disease usually measure obesity in terms of departure of actual weight from a height-weight standard. Obesity or an excess accumulation of fat, therefore, is used interchangeably with overweight or excess weight above standard weight. The limitations of using height-weight tables in this study to determine true obesity were recognized (16). Total body weight is a measure of bone, muscle, and fat, and departure from average weight may be due to one or another or a combination

of these body components. Overweight prevention and control is directed against overweight due to excess fat, primarily attributed to excess food intake over the energy demands of the individual; therefore an effort was made to identify the obese children in the overweight group.

For purposes of weight classification, children were placed in categories of average weight and overweight, and the population was arrayed from largest to smallest by relative weight. Fifty children or approximately 5 percent of the upper distribution of relative weight were chosen for each sex as overweight. The relative weight values of boys ranged from 180 to 116; for girls, from 200 to 124.

This selection of overweight subjects who have extreme relative weight values increases the likelihood that truly obese subjects have been chosen (17). The validity of relative weight measures as an indication of obesity is discussed in the statistical notes.

These findings indicate that, on the average, overweight children are fatter by measurement as well as weight than average weight children.

One hundred children were also selected for the "average weight" classification. Since the distribution of relative weight was skewed toward the higher values, average weight was computed by the median. Relative weights were 98 for boys and 97 for girls. Arbitrarily, we decided to use plus or minus five about 100. Therefore, average weights for the purpose of this study are the relative weight values from 95 through 104. In these categories, there were 425 boys and 290 girls. To select 50 children of each sex for this study, a 12 percent and 17 percent random sample of boys and girls in this weight category were taken.

Table 2 identifies relative weights of the study subjects in each weight classification with regard to the relative weights of the total school population.

#### Adult Followup

The adult followup was made in the summer of 1958 (table 3). Of the 200 children whose records were selected for the study, 174 or 87 percent were located. However, only 120 were used in this study since 47 were eliminated because of nonresidence in Washington County

between weight status of subjects who were not interviewed and those who were.

### Replacements

Subjects who were lost from the initial study group were replaced in order to maintain the original number of 50 males and 50 females in each of the sex and weight categories. Random selections were made from the reservoir of average weight persons so classified originally in the school population. Replacements for the overweight males and females were obtained by selecting the next most overweight from the distribution of relative weight below the upper fifth percentile. By this method, of course, less grossly overweight persons as originally defined were included in the final overweight group. For boys, the relative weights of replacements ranged from 116 to 108, for girls, from 124 to 110. Because relative weights as low as 108 for boys and 110 for girls were included, it was decided to identify two classifications of overweight: moderately overweight, relative weights of 105 through 119, and markedly overweight, relative weight of 120 and more.

### Results

Figures 1 and 2 illustrate the trend in weight status from childhood to adulthood of average weight and overweight children. These trends are summarized in tables 4 and 5, which show the comparison between childhood and adult weight status for males and females. For each sex, it is apparent that overweight children tend to become overweight adults more often than children of average weight. Of the 50 overweight boys, 43, or 86 percent, were overweight as adults. Of the 50 average boys, 21, or 42 percent, were overweight as adults. Approximately twice as many overweight boys were overweight adults in comparison to average weight boys. More striking differences in adult overweight status are noted in comparing overweight girls and average weight girls. Of the 50 overweight girls, 40, or 80 percent, were overweight as adults; only 9, or 18 percent, of the 50 average girls were overweight as adults. In both comparisons, the differences are statistically significant: for boys, chi-square=19.14, D.F.=1,  $P<.001$ ; for girls, chi-square=36.01, D.F.=1,  $P<.001$ .

It is also apparent from these data that markedly overweight girls and boys are more likely to become overweight adults than the moderately overweight. Seven, or 50 percent, of the moderately overweight girls were average or less than average weight as adults. This observation contrasts with 3, or 8 percent, of the 36 markedly overweight girls who were average or less than average weight as adults. The same findings, but with less difference in percentage, are noted when a comparison is made of moderately overweight and markedly overweight boys; the percentages observed are 22 percent and 4 percent, respectively. These observations reflect the loss of girls and boys in overweight categories who were selected from the upper part of the distributions of relative weight. The data suggest that if, as originally planned, only those in the upper 5 percent of the distribution had been used, more of the overweight children would have fallen into adult overweight categories.

It is quite likely that some persons are in their present weight status because of efforts toward weight reduction or because of the effect of a disability or disease. Some information was gained by asking each person about his usual weight in contrast to his present weight, with the specification that the answer apply to a period at least 6 months prior to the date of interviewing. The results indicated no significant difference in mean relative weights for males and females for the two periods of time.

### Discussion

Interest in overweight stems in great part from the role which this factor may play in the etiology of disease, particularly cardiovascular disease. The bulk of the data on weight control lies in the statistics in life insurance studies (1) which have shown repeatedly a significantly higher mortality rate for overweight persons than for persons of average and less than average weight. These findings have been supported also by data from the Framingham heart study conducted by the National Heart Institute of the Public Health Service. In the fourth year of followup of men aged 45-62 years, it was found that overweight was clearly associated with the risk of development



# Revised Tables of Average Heights and Weights

In October 1959, the Society of Actuaries published the results of the largest statistical investigation ever attempted in the field of public health, entitled "1959 Build and Blood Pressure Study." The data cover the

20-year experience of 26 large life insurance companies. Five million policyholders are represented in the revised tables of average heights (with shoes) and weights given below.

## AVERAGE WEIGHTS OF MEN

Graduated Weights (in indoor clothing) in Pounds

Age Groups

Height	15-16	17-19	20-24	25-29	30-39	40-49	50-59	60-69
5' 0"	98	113	122	128	131	134	136	133
1"	102	116	125	131	134	137	139	135
2"	107	119	128	134	137	140	142	139
3"	112	123	132	138	141	144	145	142
4"	117	127	136	141	145	148	149	146
5"	122	131	139	144	149	152	153	150
6"	127	135	142	148	153	156	157	154
7"	132	139	145	151	157	161	162	159
8"	137	143	149	155	161	165	166	163
9"	142	147	153	159	165	169	170	168
10"	146	151	157	163	170	174	175	173
11"	150	155	161	167	174	178	180	178
6' 0"	154	160	166	172	179	183	185	183
1"	159	164	170	177	183	187	189	188
2"	164	168	174	182	188	192	194	193
3"	169	172	178	186	193	197	199	198
4"	*	176	181	190	199	203	205	204

## AVERAGE WEIGHTS OF WOMEN

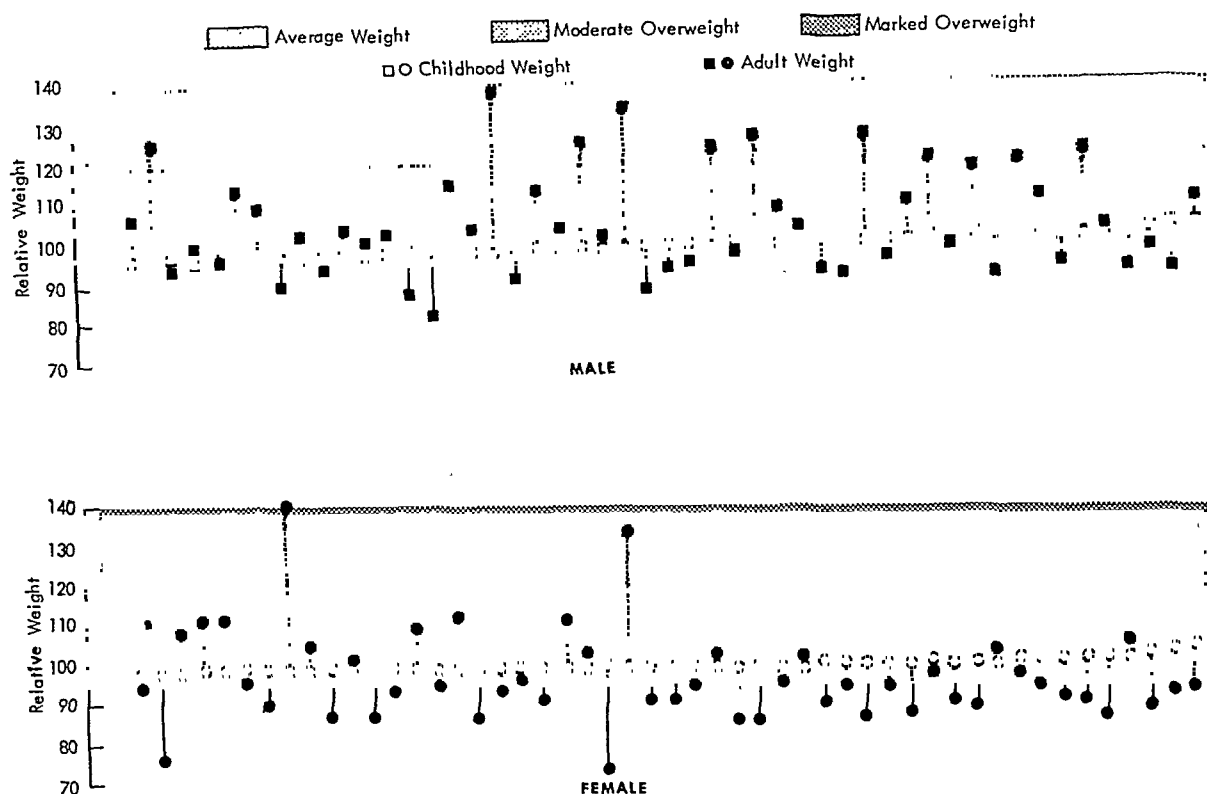
Graduated Weights (in indoor clothing) in Pounds

Age Groups

Height	15-16	17-19	20-24	25-29	30-39	40-49	50-59	60-69
4' 10"	97	99	102	107	115	122	125	127
11"	100	102	105	110	117	124	127	129
5' 0"	103	105	108	113	120	127	130	131
1"	107	109	112	116	123	130	133	134
2"	111	113	115	119	126	133	136	137
3"	114	116	118	122	129	136	140	141
4"	117	120	121	125	132	140	144	145
5"	121	124	125	129	135	143	148	149
6"	125	127	129	133	139	147	152	153
7"	128	130	132	136	142	151	156	157
8"	132	134	136	140	146	155	160	161
9"	136	138	140	144	150	159	164	165
10"	*	142	144	148	154	164	169	*
11"	*	147	149	153	159	169	174	*
6' 0"	*	152	154	158	164	174	180	*

\* Average weights omitted in classes having too few cases.

Figure 2. Adult weight status of overweight children of both sexes, 10 to 13 years of age, Hagerstown, Md., 1937-39



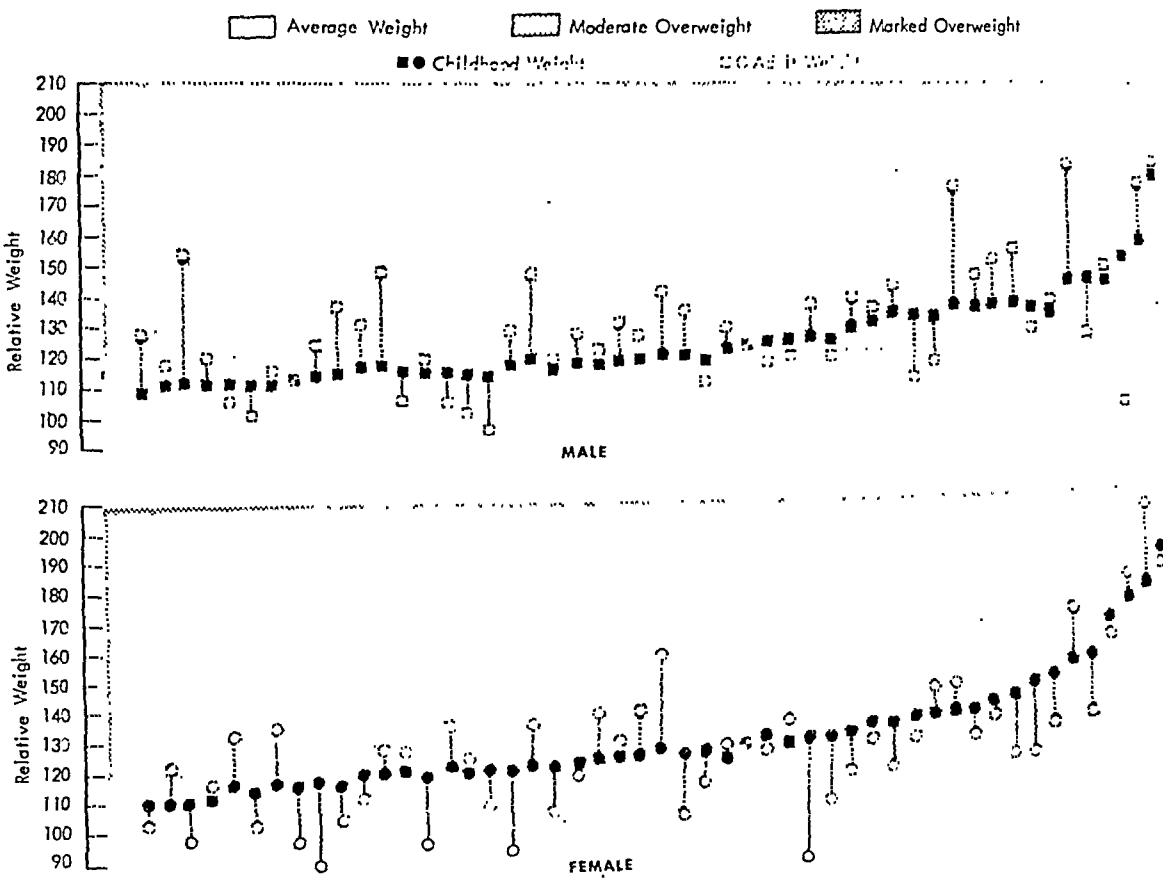
mortality from such diseases. The effect of weight control on the mortality experience of insured persons has also been reported by life insurance studies (19). These studies have added impetus to weight control as a preventive measure against cardiovascular heart disease. It was found that weight reduction

improved the health outlook for those persons who had lost enough weight to qualify for a new insurance rating. As an example, men originally limited to substandard insurance because they were moderately overweight, upon weight reduction had a lessened mortality rate of 113 percent of the standard, compared with

Table 5. Weight status by major category of selected female residents of Hagerstown, Md., as school children and as adults

Childhood weight	Selected female residents		Adult weight					
			Less than average and average weight (less than 105)		Moderately overweight (105-119)		Markedly overweight (120 and more)	
	Number	Percent	Number	Percent	Number	Percent	Number	Percent
Average weight (95-104).....	50	100.0	41	82.0	7	14.0	2	4.0
Overweight, total.....	50	100.0	10	20.0	9	18.0	31	62.0
105-119.....	14	100.0	7	50.0	2	14.3	5	35.7
120 and more.....	36	100.0	3	8.3	7	19.4	26	72.2

Figure 1. Adult weight status of average weight children of both sexes, 10 to 13 years of age, Hagerstown, Md., 1937-39



of coronary heart disease (2). Coronary heart disease incidence rates of overweight men were three times as great as those for men whose weight was below the median weight.

It has been assumed that if diseases, particularly cardiovascular diseases, are induced or adversely influenced by overweight, weight reduction would tend to decrease morbidity and

Table 4. Weight status by major category of selected male residents of Hagerstown, Md., as school children and as adults

Childhood weight	Selected male residents		Adult weight					
			Less than average and average weight (less than 105)		Moderately overweight (105-119)		Markedly overweight (120 and more)	
	Number	Percent	Number	Percent	Number	Percent	Number	Percent
Average weight (95-104)	50	100.0	29	58.0	11	22.0	10	20.0
Overweight, total	50	100.0	7	14.0	12	24.0	31	62.0
105-119	27	100.0	6	22.2	7	25.9	14	51.9
120 and more	23	100.0	1	4.3	5	21.7	17	73.9

in terms of relative weight, with the measure of obesity. Chest X-rays were available on 86 boys and 83 girls in the study group. They were read for measurement of fat at the Fels Research Institute, Yellow Springs, Ohio, by Miss Joan A. Haskell. Measurements of fat in the lower thoracic region were taken at the level of the 10th rib on both right and left sides, perpendicular to the fat shadows (20). When X-rays of this particular site were faulty due to improper positioning or extension of the chest beyond the plate, fat measurements were taken at the ninth rib. In a few cases, the X-rays were completely unreadable at both the 9th and 10th rib site, and no measurement of fat thickness was attempted. This was unfortunate since these measurements represented some of the more obese subjects. A complete series of measures was made on two different occasions. Since reproducibility was high, a mean value of fat per individual was calculated.

One approach in evaluating the relationship between overweight and obesity is illustrated in figure 3. This shows the distribution of fat thickness in the lower thoracic region of designated weight categories for boys and girls. It is apparent that the distribution of fat thickness overlaps the weight categories.

Some average weight children had fat measures equal to those of moderately and markedly overweight children. There were also some with larger fat measures. This occurred more frequently in girls than boys.

The difference in means of fat thickness, as indicated in figure 3 and table 6, shows an increase in mean fat thickness with the increase in weight status. For boys, the fat thickness was four times as great for the markedly overweight as for the average weight (10.8 mm. vs. 2.7 mm.). The comparison was approximately three times as great for girls (12.9 mm. vs. 4.4 mm.).

Comparison of the means of weight categories was made by the test of the significance using the *F* distribution in the analysis of variance after the fat distributions were normalized using McCall's technique, cited by Garn (21). The transformation to normalized *T*-score tended to normalize the fat distribution and provided equal variances. The *F* test showed a significant difference in means: Boys  $F_{.01}(2,83)=4.9$ ,  $F=36.8$ ; girls,  $F_{.01}(2,80)=4.9$ ,  $F=20.7$ .

*F* tests permit an analysis which rejects the null hypothesis that all of the means are equal, but they do not provide a procedure for comparing specific means with one another. Multiple compari-

Table 6. Measurement of fat thickness of children by major weight category and by sex

Weight group	Boys				Girls			
	Number	Fat thickness (mm.)			Number	Fat thickness (mm.)		
		Mean	Standard deviation	Range		Mean	Standard deviation	Range
Average weight.....	43	2.7	0.56	1.7-4.3	41	4.4	1.6	1.8-8.4
Overweight:								
Moderately.....	24	4.7	2.3	1.5-9.5	13	5.6	2.5	3.2-9.8
Markedly.....	19	10.8	6.4	2.9-24.3	29	12.9	9.3	3.3-39.1

Table 7. Comparison of fat thickness in weight categories of children 10-13 years of age, Hagerstown, Md., 1937-39

Comparison	Confidence limits <sup>1</sup>	
	Male	Female
Average weight-overweight.....	13.8±3.8	8.7±4.3
Average weight-markedly overweight.....	-17.1±4.8	-13.0±4.8
Moderately overweight-markedly overweight.....	-6.5±5.4	-8.6±6.6
Average weight and moderately overweight-markedly overweight.....	-11.9±4.6	-10.8±4.6

<sup>1</sup> There is evidence, using the *q* statistic at the 5 percent level to reject the zero value for all the comparisons made, using the following formula:  $\bar{X}_1 - \bar{X}_2 \pm \frac{\text{Student range}}{\sqrt{2}} \sqrt{\text{Mean square for error} \left( \frac{1}{n_1} + \frac{1}{n_2} \right)}$

the mortality rate of 142 percent for all moderately overweight males.

It has been found from studies and reports from clinics for weight control that guided efforts toward their goals are ineffective and impermanent. It would appear that early onset of overweight is an important factor to consider when persons apply for treatment. Education and therapy should be directed toward weight control in the early stages of life. According to Young and others, overweight is "probably a continuing reflection of other childhood characteristics" (12).

### Summary

A followup was made of children aged 10 through 13 years whose serial height-weights were recorded some 20 years ago to determine their present adult weight status.

It was observed that overweight children tend to become overweight adults more often than children of average weight.

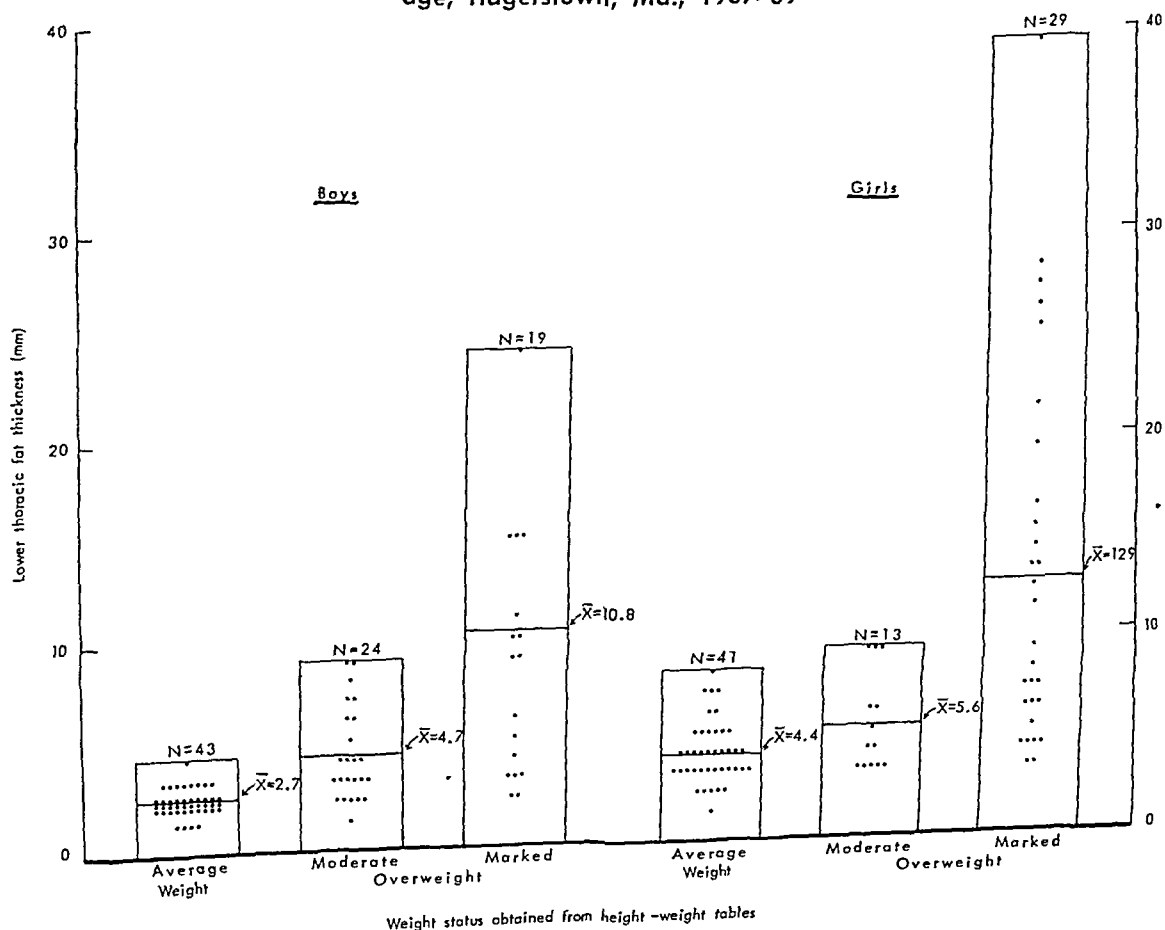
The difficulty that obese adults experience in weight control may be rooted in the fact that overweight children tend to become overweight adults. It may, therefore, be reasonable to suggest that part of the failure of traditional weight control activities is due to overemphasis on adult eating patterns.

### STATISTICAL NOTES

#### *Validation of Relative Weight Measures*

The term "overweight" is used interchangeably in this study with the term "obesity." Since overweight is defined in terms of departure of actual weight from a height-weight standard, no specific measure of fat is available. An effort was therefore made to validate the overweight measure, expressed

Figure 3. Distribution of fat thickness in weight categories, by sex, of children 10 to 13 years of age, Hagerstown, Md., 1937-39



of the distribution of relative weight. However, it should be stated that, on an individual basis, some of the overweight children, particularly the moderately overweight, could be classified as overweight not due to fat but due to frame or muscular development.

#### *Bias From Followup Attrition*

Locating and interviewing children originally examined in 1937-39 for a prospective study raised the question of how many of the selected study group could be found in 1958. Losses might introduce a bias as the weight status of the average and overweight individuals located and interviewed might not be representative of the average and overweight categories as initially selected. Tables 8 and 9 show the number of average weight and overweight males and females who were either available for interview or not available for interview in the original study selection, and the replacements made for those who were not available.

Bias is minimized in the average weight group because of the method used in selecting individuals for this category. The range of weights was plus or minus 5 percent about the relative weight of 100. This narrow range tended to decrease the difference between the weight status of those individuals interviewed and those individuals not interviewed. The difference between means was statistically not significant. For males of average weight, the mean relative weight of individuals not interviewed was 100.0 and of subjects was 99.7 ( $.2 > P > .1$ ). For females of average weight, the contrast in mean relative weights was 99.9 as compared to 99.8 ( $P > .9$ ).

The problem of attrition is more pertinent in the overweight than in the average weight category, since the range of relative weight selected from the distribution of relative weights of the total population varied from the relative weight of 180 to 116 for males and from 200 to 124 for females. The hypothesis that there is no significant difference between the distribution of relative weight of those persons who were interviewed and those who were not interviewed was tested by using the chi-square statistic. This test indicated that the difference between the groups could have arisen by chance ( $.7 > P > .5$ ) and ( $.8 > P > .7$ ).

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son tests provide this method (22). Table 7 shows the statistical evaluation of these comparisons.

It is evident that there is a significant difference in fat thickness between average weight and overweight children, between a combination of average and moderately overweight with markedly over-

weight, between moderately and markedly overweight, and between average and markedly overweight children. These findings indicate that the markedly overweight children had, on the average, a larger measure of fat thickness than those selected from the remainder of the designated area

**Table 8. Initial selections and replacements for study of male residents of Hagerstown, Md., by childhood weight status in major weight categories**

Childhood weight status	Initial group			Final group		
	Number in group	Number available	Number not available	Number in group	Number available	Number not available
<i>Average weight</i>						
Total.....	50	28	22	50	26	24
95-96.....	2	<sup>1</sup> 1	1	4	0	4
97-98.....	12	7	5	14	7	7
99-100.....	20	<sup>1</sup> 13	7	18	12	6
101-102.....	10	6	4	11	6	5
103-104.....	6	1	5	3	1	2
<i>Overweight</i>						
Total.....	50	34	16	50	32	18
105-119.....	13	<sup>1</sup> 10	3	27	9	18
120-129.....	13	7	6	7	7	0
130-139.....	16	<sup>1</sup> 11	5	10	10	0
140-149.....	5	3	2	3	3	0
150 and over.....	3	3	0	3	3	0

<sup>1</sup> Interviewed but not included in the final study group because used for presurvey testing.

**Table 9. Initial selections and replacements for study of female residents of Hagerstown, Md., by childhood weight status in major weight categories**

Childhood weight status	Initial group			Final group		
	Number in group	Number available	Number not available	Number in group	Number available	Number not available
<i>Average weight</i>						
Total.....	50	30	20	50	29	21
95-96.....	3	1	2	1	1	0
97-98.....	10	7	3	18	7	11
99-100.....	27	17	10	21	17	4
101-102.....	8	<sup>1</sup> 4	4	7	3	4
103-104.....	2	1	1	3	1	2
<i>Overweight</i>						
Total.....	50	28	22	50	27	23
105-119.....	0	0	0	14	0	14
120-129.....	12	8	4	17	8	9
130-139.....	20	<sup>1</sup> 10	10	9	9	0
140-149.....	7	4	3	4	4	0
150 and over.....	11	6	5	6	6	0

<sup>1</sup> Interviewed but not included in final study group because used for presurvey testing.

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# Health Manpower, 1930-75

WILLIAM H. STEWART, M.D., and MARYLAND Y. PENNELL, M.Sc.

**H**EALTH manpower is a matter of increasing concern to the United States in view of the rapid rate of growth of the population. The number of persons in the 48 States and the District of Columbia in mid-1959 is estimated at 177,128,000; by 1975 it is predicted to be 235,246,000, an increase of 33 percent. Whether an adequate supply of physicians, dentists, nurses, and other health personnel can be provided for the future depends on immediate planning for increased numbers of graduates in the health professions within the next few years.

## Current Physician (M.D.) Supply

With an estimated 235,000 physicians in mid-1959, excluding the graduates of that year, the ratio of physicians to population now is 132.7 per 100,000 persons. Over the past 30 years the ratio has ranged between 125 and 135.

The latest count of the number of physicians in the 1958 American Medical Directory (1) indicated that there were 226,625 physicians in the 48 States and the District of Columbia in mid-1957. This number of physicians includes all those in the Federal Government service regardless of their actual location. The ratio is 132.4 per 100,000 total population including the Armed Forces overseas.

In Alaska in mid-1957 there were 101 non-Federal physicians or 62 per 100,000 civilians; in Hawaii, 574 physicians or 104 per 100,000 civilians. Outlying areas had even relatively fewer physicians (excluding those in Federal Government service).

Area	Number of non-Federal physicians	Physicians per 100,000 civilians
American Samoa-----	3	15
Canal Zone (and the Republic of Panama)-----	187	19
Caroline Islands-----	5	12
Guam-----	17	40
Mariana Islands-----	1	13
Marshall Islands-----	2	14
Puerto Rico-----	931	41
Virgin Islands-----	24	92

Physicians range in age from under 25 years to 90 and older. Among the 226,625 in the United States in mid-1957, about 800 were younger than age 25. At the other end of the scale were about 30,000 physicians aged 65 and over, of whom only 8,000 were reported in the directory as retired or not in the practice of medicine. (An additional 3,000 younger physicians were also counted as retired or not in practice.)

The detailed age distribution of the physicians is given below:

Age group	Number	Percent
All ages-----	226,625	100.0
Under 30 years-----	23,235	10.3
30-34-----	34,163	15.1
35-39-----	31,185	13.8
40-44-----	28,635	12.6
45-49-----	27,219	12.0
50-54-----	21,815	9.6
55-59-----	16,817	7.4
60-64-----	13,021	5.7
65-69-----	10,253	4.5
70-74-----	8,250	3.6
75-79-----	6,057	2.7
80 and over-----	5,388	2.4
Unknown-----	587	.3

NOTE: Age is as of the beginning of the year 1957, based on the year of birth shown on the individual physician punchcard supplied by the American Medical Association to the Public Health Service.

*Dr. Stewart serves as chief and Mrs. Pennell is a statistician of the Division of Public Health Methods, Public Health Service.*

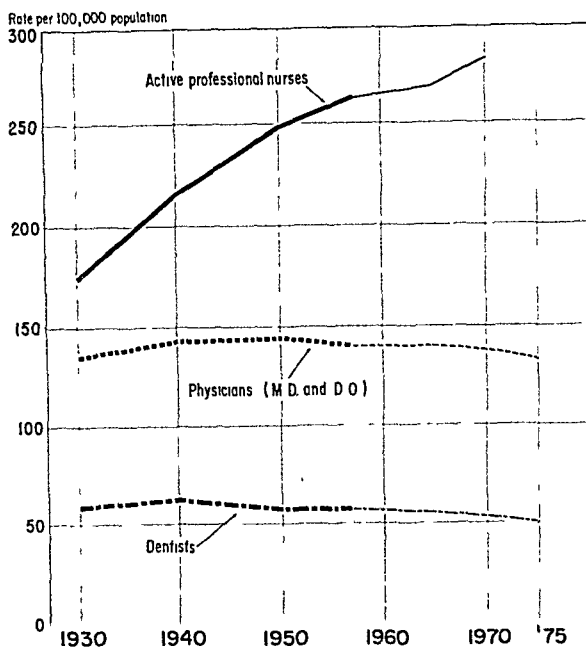
Of the physicians alive in 1957, about 86 per cent may be expected to be still living in 1965 and about 68 percent, in 1975. This number of survivors at future dates is ascertained by applying the 1956 age-specific white male mortality rates to the number of physicians in each age group, on the assumption that physicians die at about the same rate as white males of similar age in the total population. The assumption is consistent with the number of deaths reported annually to the American Medical Association.

Deaths of physicians account for 3,500 to 4,000 annual losses to the profession. Each year about 7,400 to 7,800 newly licensed physicians—graduates from medical schools in the United States, Canada, and other foreign countries—are added to the profession. Thus the annual net gain in the number of physicians is about half the number of new licentiates.

The 85 medical schools in the United States graduated 6,895 physicians in the academic year 1958-59 (2). The average (median) age at graduation is now about 26 years, the same as prior to World War II (3, 4). After this war and the Korean conflict the postponed education of veterans resulted in an increase to 28 years for median age at graduation for the class of 1950. By 1954, the median had declined to 27 years, with a further decline to 26 years by 1956. The tabulation based on recent graduates listed in the 1958 American Medical Directory shows that the disparity between ages at graduation has likewise declined. The middle 50 percent of the graduates covered a span of 5.3 years in 1950 as contrasted with 2.3 years for those graduated in 1956.

About 12 percent of the new additions to the profession in this country since 1950 were educated outside the United States. Of the physicians licensed to practice for the first time in this country in 1958, nearly 150 were graduates of Canadian schools and 1,166 were graduates of other foreign schools. The foreign school graduates include an estimated 400 American citizens who had gone to other countries for their medical education. A tabulation of recent licentiates graduated from Canadian and other foreign schools indicates that they are older, as a group, than those who enter the profession directly after graduation from U.S. medical

## Trend in health manpower



schools. The median ages of the Canadian and other foreign school graduates are 30 and 36 years, respectively, when they obtain their first license to practice in the United States, as contrasted with age 26 for U.S. school graduates who are counted as entering the profession upon graduation rather than licensing.

## Future Supply of Physicians (M.D.)

The future supply of physicians in the United States depends on (a) the current numbers now in the profession and their mortality, (b) the graduating classes of medical schools in this country, and (c) additions to the profession from Canadian and other foreign medical schools.

Of the 226,625 physicians (M.D.) in the United States in mid-1957, about 195,000 may be expected to be still alive in 1965. Between 1957 and 1965 the annual number of graduates of U.S. medical schools is planned to increase from about 6,800 to as many as 7,400. This reflects the development of new schools and expanded enrollment in existing schools, according to the American Association of Medical Colleges. During the same period the annual number of new licentiates graduated from Ca-

**Table 1. Physician supply in 1975 based on number of graduates of U.S. medical schools at level currently planned and at level required for maintaining the 1957 national ratio of physicians to population in 1975**

Year	Physicians (M.D.)		Graduates of U.S. medical schools <sup>3</sup>	New licentiates graduated from other medical schools <sup>4</sup>	Deaths among those in the pro- fession <sup>5</sup>
	Number <sup>1</sup>	Per 100,000 population <sup>2</sup>			
	Level currently planned				
1957.....	226,625.....	132.4.....	6,796	1,164	11,507
1958.....			6,861	1,316	
1959.....			6,895	1,200	
1960.....	239,350.....	132.9.....	7,070	1,000	19,910
1961.....			7,130	950	
1962.....			7,200	900	
1963.....			7,270	850	21,750
1964.....			7,340	800	
1965.....	259,950.....	132.8.....	7,410	750	
1966.....			7,410	750	23,700
1967.....			7,410	750	
1968.....			7,410	750	
1969.....			7,410	750	23,700
1970.....	279,000.....	130.5.....	7,410	750	
1971.....			7,410	750	
1972.....			7,410	750	23,700
1973.....			7,410	750	
1974.....			7,410	750	
1975.....	296,100.....	125.9.....	7,410	750	
	Level required to maintain 1957 physician-population ratio				
1965.....	259,950.....	132.8.....	7,610	750	21,740
1966.....			7,820	750	
1967.....			8,160	750	
1968.....			8,540	750	23,820
1969.....			8,910	750	
1970.....	283,000.....	132.4.....	9,120	750	
1971.....			9,430	750	23,820
1972.....			9,690	750	
1973.....			10,090	750	
1974.....			10,240	750	23,820
1975.....	311,500.....	132.4.....	10,360	750	

<sup>1</sup> For 1957, number shown in American Medical Directory 1958, table 1. For future years, numbers computed by method outlined in "Physicians in the United States: Projections 1955-1975," by G. St.J. Perrott and Maryland Y. Pennell. J. M. Educ. 33: 638, September 1958.

<sup>2</sup> Rates based on total population of the United States, including Armed Forces overseas, as of July 1; U.S. Bureau of the Census, Current Population Reports, Population Estimates, Series P-25, No. 187, Nov. 10, 1958 (p. 16, Series II). Thousands of persons: 171,196 in 1957; 180,126 in 1960; 195,747 in 1965; 213,810 in 1970; 235,246 in 1975.

<sup>3</sup> Figures for 1957 and 1958 published in J.A.M.A. (Education Number) 168: 1503, Nov. 15, 1958; preliminary number for 1959. Figures for 1960-64 estimated by Public Health Service on basis of current enrollments. Figure for 1965 furnished by American Medical Association to House of Representatives Committee on Interstate and Foreign Commerce (85th Cong., 1st sess.); see Medical School Inquiry, p. 243. Figures for 1966-75 estimated by Public Health Service.

<sup>4</sup> New licentiates graduated from foreign schools: 1,014 in 1957 and 1,166 in 1958; J.A.M.A. (State Board Number) 170: 603, May 30, 1959. Licentiates of Canadian schools not reported by A.M.A. estimated as 150 per year. Figures for 1959-75 estimated by Public Health Service.

<sup>5</sup> Deaths computed on basis of 1956 age-specific white male mortality; National Office of Vital Statistics, Special Reports 6: 48, June 19, 1958 (table 2). Age distributions of physicians in 1957 of recent graduates of American medical schools and of recent licentiates graduated from Canadian and foreign medical schools were obtained from individual physician punchcards supplied to Public Health Service by American Medical Association.

nadian and other foreign medical schools may decrease. A conservative estimate for the year 1965 is 750, of whom 100 to 150 are graduates of Canadian schools and the balance are graduates of other foreign schools.

As shown in table 1, the number of physicians is expected to be nearly 260,000 in 1965, with a ratio of 132.8 physicians per 100,000 population (5). This 1965 ratio is almost the same as that of 1957 but shows a decline from the 134.9 level of 1949.

From 1965 to 1975, the annual number of graduates of U.S. medical schools may continue at the level of about 7,400 in accordance with the currently planned output of these schools. These graduates may be supplemented by an average of 750 graduates of Canadian and other foreign schools newly licensed each year. After death has taken its toll from both those already in the profession and the new additions, the number of physicians is expected to be about 279,000 in 1970 and 296,000 in 1975. The physician-population ratio will decline from the 1965 level of 132.8 physicians per 100,000 population to 130.5 in 1970 and still further to 125.9 in 1975.

If it is assumed that the ratio of physicians to population which prevailed in 1957 is the appropriate goal for 1975, there will be need for 311,500 physicians, instead of the 296,100 expected on the basis of the level of U.S. school output currently in sight. To obtain this total will require about 10,360 graduates of U.S. medical schools in the year 1975. This number of graduates is nearly 3,000 above the number now expected under current plans. Such an increase will have to be met through the expansion of existing schools and the construction of about 25 new schools, some with 2-year and some with 4-year programs.

#### Physicians (D.O.)

In 1930, the United States had approximately 10,300 doctors of osteopathy. By 1959 the number had increased to 14,100, giving a ratio of 8.0 per 100,000 population (table 2).

The six schools of osteopathic medicine graduated 469 physicians (D.O.) in 1959 (6,7). Currently planned enrollments indicate that by 1965 the annual graduating class may be increased to about 525.

If the output of these schools continues at the same level during the following decade, the supply of osteopathic physicians is expected to reach 16,700 by 1975, with the ratio declining to 7.1 doctors per 100,000 persons.

#### Dentists

Increases in dentist supply have been lagging behind population growth for more than a generation. From fewer than 75,000 dentists in 1930, the total supply in the 48 States and the District of Columbia has grown to almost 100,000 at the present time. Yet there are now only 56 dentists per 100,000 persons as compared with a ratio of 59 in 1930.

The dentist totals (table 2) include those in the Federal Government service and those retired or not in practice, but exclude graduates of the years concerned (8). While nearly all of the dentists of 1930 were of working age and active in the profession, today's dentist supply includes a large proportion who are inactive. As a result, the number of active dentists in relation to population has fallen even more steeply, dropping to only 49 per 100,000 persons in 1959, according to estimates prepared by the Public Health Service, Division of Dental Resources.

In mid-1957, one-quarter of the dentists were 60 years of age or older (9), as shown below:

Age group	Number Percent	
	All ages-----	97, 610 100. 0
Under 30 years-----	7, 492	7. 7
30-34 -----	12, 539	12. 8
35-39 -----	13, 137	13. 4
40-44 -----	9, 752	10. 0
45-49 -----	9, 249	9. 5
50-54 -----	10, 556	10. 8
55-59 -----	10, 355	10. 6
60-64 -----	9, 651	9. 9
65-69 -----	6, 233	6. 4
70-74 -----	3, 720	3. 8
75-79 -----	2, 714	2. 8
80 and over-----	2, 212	2. 3

Alaska had 47 non-Federal dentists, or 28 per 100,000 civilians in 1958. With 356 non-Federal dentists in Hawaii, the ratio was 62 per 100,000 civilians.

The U.S. dental schools number 47, having risen from 39 at the end of the war. In the

academic year 1957-58 they graduated 3,083 dentists (10). The median age at graduation is now about 26 years, having been 28 years in the period 1950-54 and 25 years prior to World War II (9).

Although the annual number of graduates is nearly 80 percent more than the number graduated 10 years earlier, this expansion has not produced enough new dentists to maintain the pre-war dentist-population ratio. Furthermore, at currently planned levels of school output the ratio of dentists to population will

continue its steady decline, as illustrated in the accompanying chart.

The annual number of graduates is expected to increase to nearly 3,500 by 1965. Unless there are further increases, however, the total number of dentists in the United States in 1975 will reach about 118,000. This number will be equivalent to only 50 dentists per 100,000 persons, of whom 46 will be active in the profession.

To regain the 1958 dentist-population ratio will require 133,250 dentists in 1975. An addi-

**Table 2. Supply of physicians, dentists, and active professional nurses: United States, 1930-59, with projections to 1975**

Year	Physicians			Dentists <sup>3</sup>	Active professional nurses <sup>4</sup>
	Total	M.D. <sup>1</sup>	D.O. <sup>2</sup>		
	Estimated number				
1930	161,900	151,600	10,300	73,100	214,300
1940	187,600	175,200	12,400	81,700	284,200
1950	216,200	203,500	12,700	86,900	375,000
1957	240,300	226,600	13,700	97,600	445,000
1958	244,500	230,600	13,900	98,540	460,000
1959	249,100	235,000	14,100	99,400	467,000
1965	274,800	259,900	14,900	106,700	526,000
1970	291,900	279,000	15,900	112,900	608,000
1975	312,800	296,100	16,700	118,100	---
	Rate per 100,000 population <sup>5</sup>				
1930	133.9	125.5	8.4	59	175
1940	142.0	132.6	9.1	62	216
1950	142.5	131.2	8.3	57	249
1957	140.1	132.4	8.0	57	263
1958	140.5	132.5	8.0	57	268
1959	140.5	132.7	8.0	56	267
1965	140.1	132.8	7.6	55	269
1970	137.9	130.5	7.4	53	284
1975	133.0	125.9	7.1	50	---

<sup>1</sup> Number of M.D.'s for 1957 from American Medical Directory, 1958; data for prior years based on earlier directories, projections by Public Health Service (see methodology in table 1).

<sup>2</sup> Number of D.O.'s for 1957 from A Statistical Study of the Osteopathic Profession, December 31, 1957, data for prior years based on survival of graduates of U.S. schools of osteopathy, projections by Public Health Service.

<sup>3</sup> Number of D.D.S.'s for 1950-58 from Distribution of Dentists in the United States by State, Region, District and County (annual issues), adjusted to exclude graduates of years concerned, data for prior years based on survivals of graduates of U.S. dental schools, projections by Public Health Service.

<sup>4</sup> Number of nurses for 1958 from Facts About Nursing, 1959 edition, 1957 figure is midpoint between 1956 and 1958 totals; data for prior years based on census enumerations, adjusted to exclude student nurses, projections by Public Health Service.

<sup>5</sup> Rates for physicians and dentists based on total population including Armed Forces overseas since persons in Federal service outside the U.S. are included. Rates for nurses based on total population excluding Armed Forces overseas since nurses in Federal service outside the U.S. are excluded.

tional 2,700 graduates will be needed that year above the 3,500 currently planned for existing schools. This means a 75 percent increase in training capacity.

### Professional Nurses

The nurse-population ratio in the United States has increased almost fivefold since 1910, according to the Public Health Service's Division of Nursing Resources. The ratio now is 267 per 100,000 population, with an estimated 467,000 active professional nurses in the 48 States and the District of Columbia in mid-1959 (table 2). The total number of graduate professional nurses probably exceeds 800,000 including those who are inactive for any reason.

In Hawaii there were 1,681 active registered nurses, or 320 per 100,000 civilians in 1956 (11). Data for Alaska are not available.

The 1,145 schools of professional nursing enrolled about 113,000 students and graduated 30,410 nurses in the academic year 1957-58 (12). Admissions to these schools may increase markedly by the mid-sixties, with the annual number of graduations up to 37,000 by 1965 and still going higher.

The number of nurses in relation to population will increase in accordance with the currently planned output of nursing schools. The ratio is expected to be 284 nurses per 100,000 persons in 1970, with about 608,000 professional nurses in active practice.

### Summary

The future supply of physicians is not expected to keep up with the greatly accelerated rate of growth of the population. The predictions take into account estimates of the graduates of medical schools in the United States, new licentiates graduated from Canadian and other foreign medical schools, and deaths among those in the profession.

The number of graduates of U.S. medical schools currently predicted for existing and planned schools is expected to increase from about 6,900 in 1959 to 7,400 in 1965. The number of physicians (M.D.) in the latter year will be about 260,000, or 132.8 per 100,000 population which is about the present ratio.

If the number of graduates of U.S. medical schools were to remain at about 7,400 per year between 1965 and 1975, while the foreign-educated physicians entering practice in this country leveled off at 750 per year, the number of physicians (M.D.) in 1975 would be increased to 296,000. The ratio, however, will decrease to 125.9 physicians per 100,000 persons. If the annual number of U.S. graduates were to be increased sufficiently to maintain the present physician-population ratio in 1975, the 1975 graduating class would have to be increased to approximately 10,360, in order to have 311,500 physicians (M.D.) in that year.

The number of osteopathic physicians is about 14,000, with 469 graduates in 1959. If the annual graduating class is increased to about 525, by 1975 the supply of physicians (D.O.) may reach 16,700. The ratio to population will have declined, however, from 8.0 to 7.1 doctors per 100,000 population.

Increases in dentist supply have been lagging behind the population growth despite large gains in the numbers being graduated. The annual number of graduates is expected to increase from the present 3,100 to nearly 3,500 by 1965. Unless there are further increases, the number of dentists in 1975 will be about 118,000, or 50 per 100,000 population. To regain the 1958 ratio of 56 dentists per 100,000 population requires 133,000 dentists in 1975 and an additional 2,700 graduates that year above the number currently planned.

The supply of professional nurses has more than kept pace with the population growth. With 467,000 nurses now active, the ratio is 267 per 100,000 persons. The annual number of graduates is expected to increase from 30,400 in 1958 to 37,000 in 1965 and continue upward. On this basis, the ratio is expected to be 284 active professional nurses per 100,000 population in 1970.

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- (8) American Dental Association, Bureau of Economic Research and Statistics: Distribution of dentists in the United States by State, region, district and county. Chicago, 1958, p. 5.
- (9) American Dental Association, Bureau of Economic Research and Statistics: An inventory of dentists: age, membership, type of practice, dental school and location. J. Am. Dent. A. 58: 93-101, May 1959.
- (10) American Dental Association, Council on Dental Education: Dental students' register, 1958-59. Chicago, 1959, tables 1 and 5.
- (11) American Nurses Association: Facts about nursing: a statistical summary, 1959 edition. New York, p. 9.
- (12) National League for Nursing: State approved schools of professional nursing, 1959 edition. New York, p. 40.

## films

### A Survey of Refuse Disposal Methods

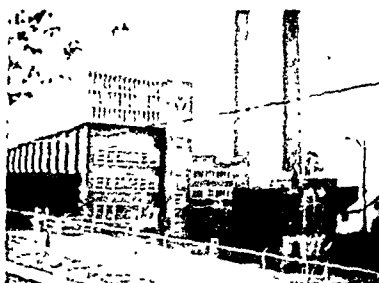
16-mm. filmograph, color, sound, 358 feet, 10 minutes, 1959, cleared for television. (Order No. FG-328.)

**Audience:** Sanitarians and State and local officials responsible for refuse disposal facilities.

This filmograph demonstrates the advantages and disadvantages of all widely used methods of refuse disposal—ranging from open dumps, dumping in oceans and rivers, and backyard burning to metropolitan incineration and sanitary landfills.

The filmograph is available on short-term loan, in the United States only, from the Communicable Disease Center, Public Health Service, Post Office Box 185, Chamblee, Ga.

It can be purchased from United World Films, Inc., 1445 Park Ave., New York 29, N.Y.



### The Membrane Filter

35-mm. filmstrip, color, sound, 80 frames, 12 minutes, 1959, not cleared for television. (Order No. F-386.)

**Audience:** Anyone who might be expected to use the filter techniques.

Designed to familiarize audiences with the use of the membrane filter, this filmstrip depicts its advantages

and disadvantages as compared with other methods of examining water, outlines the newest techniques and procedures, and shows the equipment required.

For short-term loan, in the United States only, the filmstrip is available from the Communicable Disease



Center, Public Health Service, Post Office Box 185, Chamblee, Ga. It can be purchased from United World Films, Inc., 1445 Park Ave., New York 29, N.Y.

# Federal Publications

**From Research to Classroom Laboratory, Part 2.** A series of demonstrations on the science and engineering of man's environment for healthier living. *OM 1274; 1959; 52 pages.*

Eight experiments designed to bring an awareness of environmental health factors to high school students are reprinted from the *Science Teacher*.

Subjects investigated are fluoride contamination of food materials, additives in meat, taste and odor contaminants in drinking water, fluid metering, reducing evaporation of water by using hexadecanol, culturing bacteria on membrane filters, high-temperature, short-time pasteurization of milk, and determination of half-life.

Experiments given in part 1 are listed.

**A Dental Society Reports on Budget Payment.** A case study of the Kana-wha Valley Dental Society payment plan. *PHS Publication No. 717; 1959; 28 pages.*

Organization, operation, and first year's utilization of a budget payment plan in which patients finance dental care through special bank loans at nominal interest rates are described.

The dentists' reasons for joining the plan, effects they believed it would have on dentist-patient relationships and financial aspects of practice, and the plan's possible contribution to better oral health standards for the community are discussed in relation to utilization patterns.

**Principles for Planning the Future Hospital System.** A report of proceedings of four regional conferences. *PHS Publication No. 721; 1959; 234 pages; \$1.25.*

Regional conferences held in Chicago, New Orleans, Salt Lake City, and Washington, D.C., during April and May 1959 are recounted for groups or individuals concerned with hospital planning.

Divided into three parts, this report presents all the major speeches along with a condensation of each speech, a report from each of the 16 workshops and a summary of their activities, and a listing of registered participants.

The appendix contains background material used as a basis for discussion.

**Patients in Mental Institutions, 1956. Part I. Public institutions for mental defectives and epileptics. Part II. Public hospitals for the mentally ill. Part III. Private hospitals for the mentally ill and general hospitals with psychiatric facilities. Part IV. Private institutions for mental defectives and epileptics.** *PHS Publication No. 632; 1959; part I, 48 pages; part II, 72 pages; part III, 41 pages; part IV, 27 pages.*

Tabulations of basic statistical data on the movement of patient populations in mental institutions for each State and the United States are presented. The data were derived from the 30th annual census of patients in mental institutions.

Parts I and II contain detailed tables on first admissions and resident patient characteristics, on personnel, and on maintenance expenditures. Parts III and IV present characteristics of first admissions to private mental hospitals and private institutions for mental defectives. Part III also includes characteristics of patients discharged from psychiatric facilities of general hospitals. Scope and limitations of the data are discussed, and a section on definitions is included in each part.

**Sources of Morbidity Data, Listing Number 7, 1959.** *PHS Publication No. 716; 1959; 88 pages.*

Descriptions of 116 current morbidity statistics projects are grouped according to disease category or injury. Projects are indexed by type of data collection, organizations re-

sponsible for the research (by State), and principal investigators. Status of incompleting projects from previous listings is given in the section of supplementary notes.

The listings are published primarily for the use of research workers and persons planning public health programs. Tearsheets of the project descriptions are available for persons who inquire about studies of a particular type.

**Proceedings, 1959 Annual Conference of the Surgeon General, Public Health Service, and the Chief, Children's Bureau, with State and Territorial Health Officers.** *PHS Publication No. 722; 1960; 27 pages.*

Recommendations and actions of the Association of State and Territorial Health Officers are presented in separate sections for each of its standing and special committees and for the Long-Range Planning Subcommittee.

Committees cover Federal relations, environmental sanitation, hospitals and mental health, infectious diseases, long-term illness and health of the aging, maternal and child health, health and medical services, research, civil defense, Indian affairs, and migrant labor.

Resolutions adopted by the Association of State and Territorial Health Officers are also presented. Officers and executive committee members of the association are listed for 1958-59 and 1959-60.

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This section carries announcements of new publications prepared by the Public Health Service and of selected publications prepared with Federal support.

Unless otherwise indicated, publications for which prices are quoted are for sale by the Superintendent of Documents, U.S. Government Printing Office, Washington 25, D.C. Orders should be accompanied by cash, check, or money order and should fully identify the publication. Public Health Service publications which do not carry price quotations, as well as single sample copies of those for which prices are shown, can be obtained without charge from the Public Inquiries Branch, Office of Information, Public Health Service, Washington 25, D.C.

The Public Health Service does not supply publications other than its own.

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# Echoes

## THE NATIONAL HEALTH SURVEY\*

### SCOPE AND METHOD OF THE NATION-WIDE CANVASS OF SICKNESS IN RELATION TO ITS SOCIAL AND ECONOMIC SETTING

By GEORGE ST. J. PERROTT, *Principal Statistician*, CLARK TIBBITTS, *Field Director*,  
and ROLLO H. BRITTEN, *Senior Statistician*, United States Public Health Service

During the winter of 1935-36 the United States Public Health Service inquired into the state of the Nation's health and underlying social and economic factors by means of a house-to-house canvass of over 700,000 households in urban communities in 18 States<sup>1</sup> and 37,000 households in rural areas in 3 States. The present paper sets forth the purpose and scope of the survey, outlines in some detail the method of sampling and canvassing, compares various aspects of the population with 1930 Census data as a rough measure of the reliability of the Health Survey sample, and records the major definitions employed in the survey. Subsequent papers to be published in the PUBLIC HEALTH REPORTS or as special monographs will present the detailed findings.

#### SCOPE OF THE SURVEY

The data necessary for comprehensive analysis of national health problems are not available from regularly compiled records. Local, State, and Federal health agencies collect information principally on births, deaths, and a limited list of incompletely reported communicable diseases. On the frequency of accidents and disabilities resulting therefrom, only approximate estimates based on records of insurance companies, workmen's compensation commissions, and industrial and safety organizations have been available. As to the provision of medical care, records of doctors, hospitals, and health agencies lack the uniformity and centralization necessary for statistical comparisons. Any adequate picture of care received in relation to needs can be obtained only through family reporting.

SEPTEMBER 15, 1939, pp. 1663-1687

The goal and scope of the 1935-36 National Health Survey of the Public Health Service were defined by George St. J. Perrott, Clark Tibbitts, and Rollo H. Britten in this article which also outlined survey methods and techniques.

*Nursing home aides were trained in pilot study in Oklahoma to find answers to questions on course standards, staffing, and administration and to observe corollary improvements in patient care.*

## Training Nursing Home Aides

GENEVIEVE R. SOLLER, R.N., B.S., M.P.H.

**F**EW TASKS are more perplexing for the public health worker than those concerned with improving the care of the patient in the nursing home. The average patient is old and has a long-term disease or a disability, which may be exaggerated or complicated by existing socioeconomic, emotional, and spiritual problems. Meeting the needs of the patient requires not only special knowledge and skills to cope with his medical condition but also the ability to understand and deal with his personal problems.

Essentially, the primary service given in the nursing home is nursing care. This may range from the nurturing, protective type to the more complex and comprehensive; from tasks requiring know-how easily gained through observation or training on the job to those acquired only through extensive technical training and professional education.

A substantial number of nursing home patients are receiving nursing care that is not of professional quality or planned to meet individual needs. Most frequently the care is given by untrained, unskilled nursing aides who find themselves called upon to perform tasks requiring skills, knowledge, and judgment beyond their competencies. More often than not, the

"nursur" of the patient is functioning without benefit of qualified nurse supervision or procedure manuals.

For special training of nursing home personnel, the Public Health Service developed the manual "How to be a Nursing Aide in a Nursing Home." The manual contains selected nursing procedures to be taught to nursing aides and adapted by nursing homes to standardize practices and maintain a higher quality of care. The Public Health Service also allocated funds for a pilot study in a single State to test the manual, train aides, and note observable changes, if any, in patient care. It was recommended that the study method be simple and easily duplicated by another State. The study was expected to yield significant information useful to the State in planning and strengthening its nursing home program.

Oklahoma was selected for the study, conducted from January 1 to December 31, 1958, because the Oklahoma State Department of Health is responsible for licensing nursing homes; the problems related to nursing home care were likely to be similar to those in other States; and the State had had previous experience in training nursing aides for hospital service. In line with the purposes stated above, the study sought to demonstrate how patient care can be improved in nursing homes through planned instruction of nursing aides using the content of the manual and the rapid training method of teaching (1), and to find answers to questions relating to course admin-

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*Mrs. Soller serves as assistant chief nurse of the Chronic Disease Branch, Public Health Service. The paper is based on a report of the study prepared by Norma C. Schaefer, Oklahoma State Department of Health, and Mrs. Soller.*

istration, staffing, teacher and trainee-aide recruitment, and training costs.

This paper recapitulates the highlights of the study project method, findings, and recommendations.

### Method of Study

The pilot study was organized and administered by the division of public health nursing, Oklahoma State Department of Health, with other divisions cooperating to assure integration with the total program of the health department. Consultation, assistance with data analysis, and preparation of the final report were provided by the Public Health Service's Chronic Disease Branch (fig. 1).

The central office staff consisted of a full-time coordinator, a qualified nurse consultant familiar with the rapid training method of teaching, and a part-time secretary. The coordinator's function was to select and train teachers for the courses; promote, coordinate, evaluate the study; and collect data.

State and local advisory committees were appointed to give support and assistance to the current study and possible future training programs. The limited membership was representative of public and private agencies, institutions, or groups interested in or giving services to nursing home patients. Local health department nursing personnel assisted with community organization, public education, and teacher recruitment. One of the purposes of the study was to determine whether graduate professional or licensed practical nurses living in the local area could be recruited to give aide training. The teachers were to be employed on an hourly basis to organize the courses, teach the aides, and supervise their practice in the nursing home as well as collect data.

The collection of data was a continuous activity and the responsibility of the teachers and the coordinator. Application blanks, evaluation forms, teacher observational visits to nursing homes, classroom and anecdotal records, narrative reports, and terminal conferences were used to gather information for use in the study and for planning future programs.

The study group, consisting of 71 nursing homes taken from the 1957 licensed nursing

home population, included 4 types of geographic areas: metropolitan, cluster, scatter, and rural.

Of the 291 nursing aides employed in the nursing homes, 211 were nominated for training by operators of these homes. The teachers made the final selection of trainee-aides on the basis of their ability to read and write; whether they actually were giving patient care; and their willingness to complete the course.

### Teacher Training

The study coordinator conducted a 3-day workshop for the teachers. They were acquainted with the study purposes, policies, procedures, training methods, forms for collecting data, and the relationship of the study to the objectives and procedures of the State health department's nursing home program. A visit was made to a nursing home for orientation to the nursing environment, types and characteristics of the patients, and the teachers' role and functions. In addition to the workshop, teachers attended two conferences: the first, at the midway period of the pilot study and the second, at the end. The first conference provided an opportunity for progress reports, exchange of ideas and experiences, and discussion of problems and possible solutions. The second was held to assess the total project and to receive recommendations for improving the course and for revising forms used to collect data.

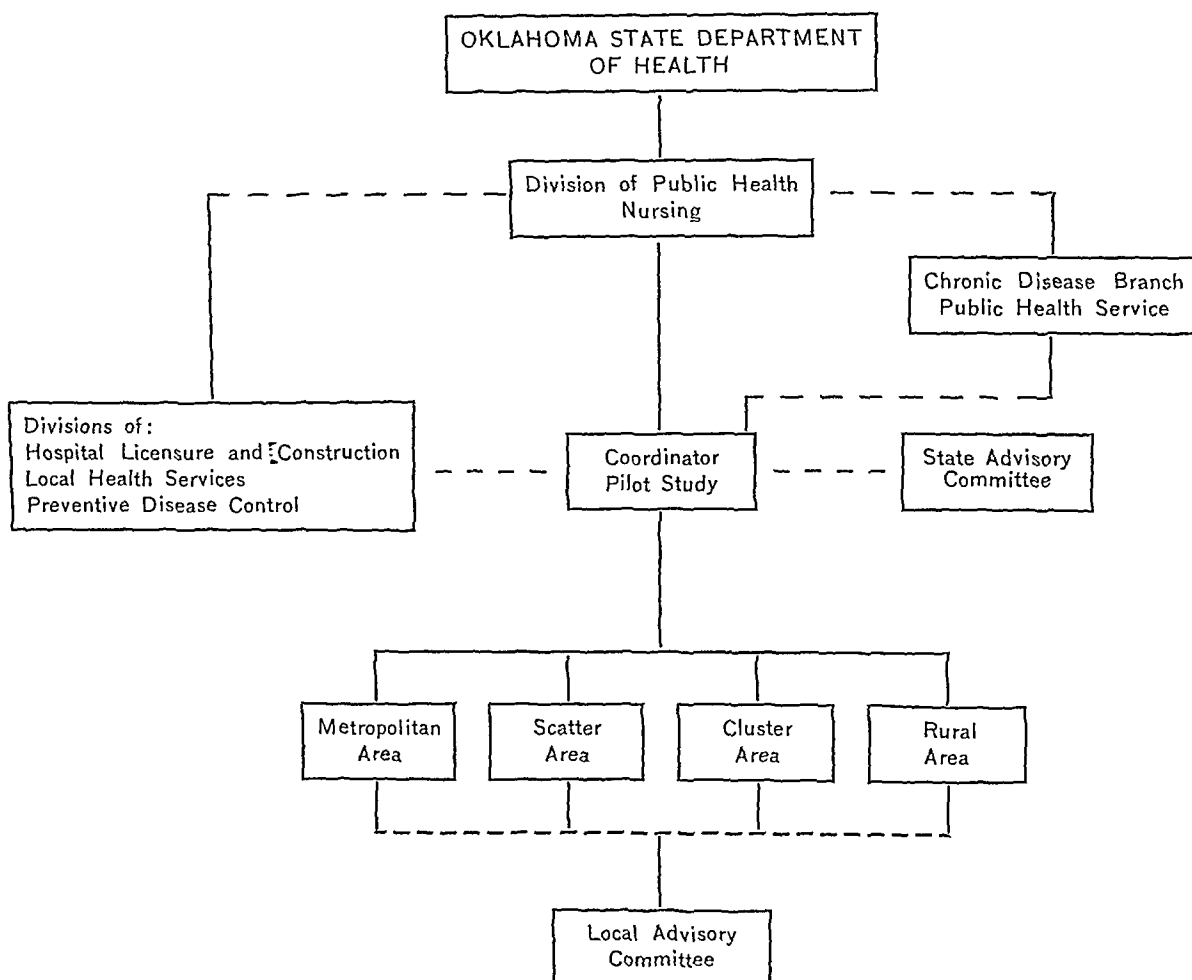
Prior to organizing a course, the teacher visited each of the nursing homes from which aides were to be trained to familiarize herself with the work environment and prepare for limited supervised practice for the trainee. At the same time, she informed the operator of the nursing home of the plan for a followup visit to the home 3 months after completion of training to observe the job performance of the aide.

Courses for the aides were conducted in temporary training centers located and equipped either by the local advisory committee, teacher, health department, or community, or a combination of these.

### Development of Course Content

There was no pattern for the teacher to follow in the development of the course. Each

Figure 1. Organizational chart of the pilot study



teacher experimented with the number of class hours required to teach the content and to supervise practice. The class size was limited to not less than 6 and no more than 10 trainees.

The training manual provided the primary content for the course, but the sequence of the units and the selection of procedures to be taught were left to the judgment of the teacher.

To help the teacher determine the nature of the training needed by the aides, the operators of the selected nursing homes were asked to classify patients by judging their nursing needs. Teachers also attempted an inventory of tasks that trainee-aides performed to determine what competencies should be expected of the aides and what preparation would be needed to meet their job requirements. On the basis of observations in the nursing home, pa-

tient classification, and the inventory, the teacher developed the course content. It is worth noting that some of the tasks that the aides professed to be performing were highly technical and, according to the recent function studies of the American Nurses' Association, would require the knowledge and skill of a professional nurse.

### Findings

Of the 71 homes participating in the study, approximately 20 percent had been in operation less than a year. Most of them had less than 20 beds with an estimated 83 percent occupancy. It was estimated that 81 percent of the patients were on some form of public assistance.

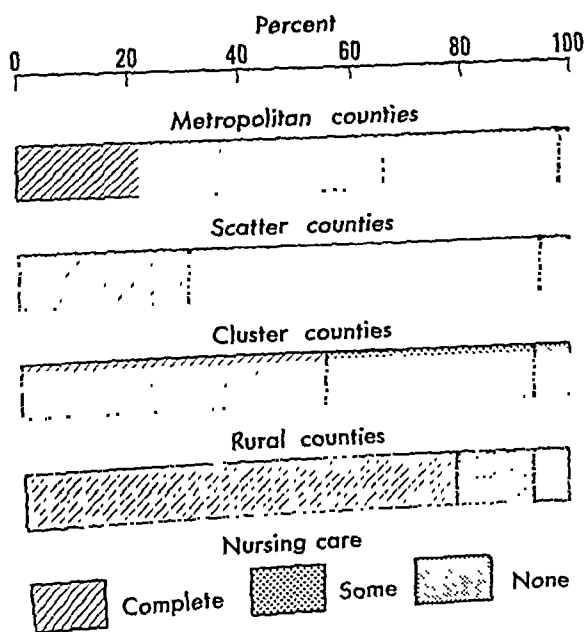
As perceived by the operators, approximately

two-thirds of the patients required complete bed care and about one-third some nursing care. The small number remaining were considered capable of self-care (fig. 2). The department of public welfare pays more for the patient on bed care than self-care, which may have influenced the classification.

The operators of the homes had a variety of background experiences. By far the largest number (49 percent) were housewives; the next largest group (42 percent) had some business experience. Thirteen percent listed themselves as licensed practical nurses by waiver and not by education. The situation calls for concern because not a single graduate nurse was among the operators or employees in the homes. Although no operator reported preparation for administering a nursing home, it must be recognized that no educational institution within the State offers a course in nursing home administration. The operators assume responsibility for the management of the home, judge the patients' nursing needs, plan patient care, and assign tasks for the aides to perform or do the jobs themselves.

Turnover in nursing aide staff was high in all nursing homes in the study group. In the scat-

Figure 2. Percentage distribution of patients in 71 nursing homes according to nursing care classifications, by geographic areas



## Definitions

Geographic area classifications referred to in the study were defined as follows:

*Metropolitan*: a city-county under supervision of the health department with nursing homes of all sizes located in the city and county.

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ter area approximately 75 percent had been in their jobs less than 1 year as compared with 65 percent in the cluster area, 49 percent in the metropolitan area, and 43 percent in the rural area. No attempt was made to determine the causes of the high rate of aide mobility. However, one teacher reported: "In one home the aides work 10 hours a day, 7 days a week, and are docked from their check if they take a day off. There are no paid vacations. As a result they are changing employees frequently." Other teachers told of "raider" practices among the homes. Nursing aides sometimes "raid" the employer's nursing home of patients, resign, and open their own facility. Standards of practice and the quality of patient care were most likely affected by the frequent change in staff personnel.

The age range of the 211 trainees was 21 to 75 years, with the median age 45 years. The majority were married and maintained homes in addition to service for hire. The level of education ranged from fourth grade through college. Figure 3 presents a graphic picture of this distribution based on 204 responses to questionnaires on education and background: 44 percent completed seventh grade or less; 38 percent completed eighth grade; 16 percent finished high school; and 2 percent, college. These persons give nursing care regardless of the degree of medical illness or level of nursing care required. Unfortunately the functions of nursing aides had not been defined by the State,

therefore no criteria were available to determine what they should or should not be doing. Prior to the study, no training facilities or courses were available to prepare the aide for the job.

Of the 211 nursing aides who enrolled, 184, or 87 percent, completed the course. Fifty-one were operators of nursing homes; however, for purposes of the study they were classified as aides. The largest number of "drop-outs" occurred during the latter part of the course. The teachers queried operators to determine the causes of "drop-outs" and concluded they were mainly: personal reasons, "knew it all," had previous training, fired, and other business employment.

The 24 training courses conducted ranged in length from 3.5 to 8.5 weeks. No definite number of hours was selected for teaching the procedures in the manual. Class periods lasted for 3 hours a day and were held twice a week. The actual hours of classroom teaching ranged from 21 to 51; the median was 34.5 hours. One teacher who had participated in the hospital aide training program thought 40 to 60 hours should be spent for the classroom teaching rather than the 30 hours she taught. Another

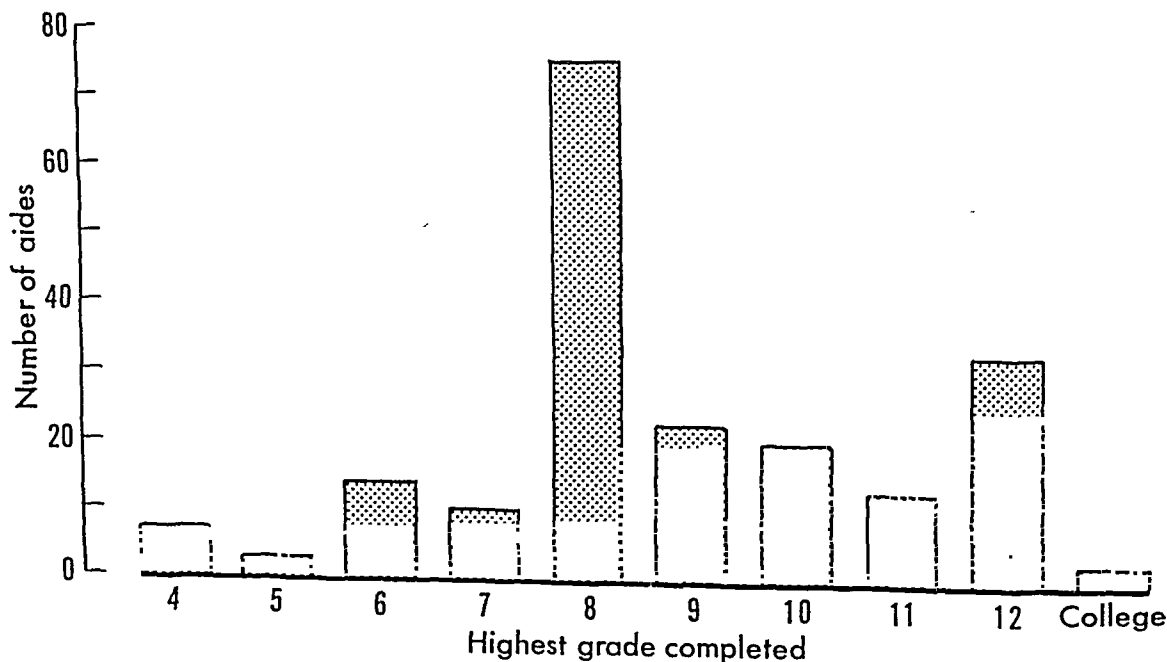
teacher, formerly on the staff in a school of practical nursing, thought 51 hours inadequate for training aides having the education level of her group. Supervised practice ranged from 8 to 20 hours. The time of day the teacher supervised practice varied from 6:30 a.m. to 5:00 p.m. The total course hours, including classroom teaching and supervised practice, ranged from 31 to 60 hours; the mode was 40 to 49 hours.

### Evaluation

Subjective evaluation of the training courses by aides, operators, and teachers was also part of the study. At the end of each course, each aide and operator had an opportunity to express her reactions anonymously through an unstructured opinionnaire. The teachers made an overall evaluation, at the end of the study, of their own orientation, teaching methods, supervision of practice in the home, content of the course, and changes in the nursing care of patients and the behavior of the nursing aides.

About 80 percent of the aides considered the course helpful, useful, important, interesting, or a good review. More than 60 percent reported that they learned new skills and the

Figure 3. Educational level of 204 nursing aides in the pilot study

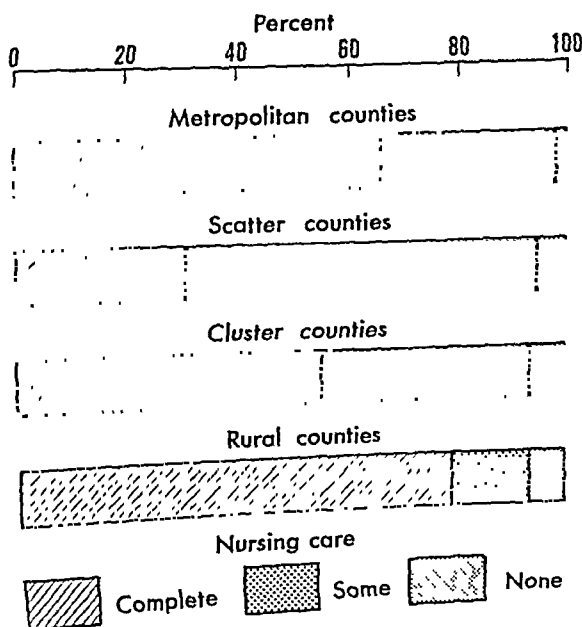


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of equipment and supplies, lack of standards of nursing care, and lack of qualified nurse supervision. Inadequate staffing and frequent changes in staff affected the time she had to carry out procedures accurately and skillfully. Frequently the assigned tasks were beyond her abilities; sometimes the duties were in a different area, such as laundry work and housekeeping.

Of the teachers, 57 percent pointed out the need for improved personnel policies and better salaries for nursing aides. One teacher suggested that the doctors be informed of what the aide has been taught to do and her limitations, thus providing him with criteria for the selection of patients and referral to nursing homes.

### *Observable Effects*

Though no tests or objective measurements of change in patient care were made before or after the nursing aides were trained, there was evidence of changes or improvement in patient care. In observing the practices of the aides before and after training, the teacher-trainers concluded that patient care had improved in most of the nursing homes. Nursing home administrators concurred in this conclusion as did the public health nurses who evaluate the homes for the State licensure agency. While these reports were all subjective in that each person was free to use her own criteria for evaluation, the agreement is noteworthy, and we believe, indicative of real improvement in care.

One of the most striking indications of improvement was in the personal appearance of patients as a result of better general nursing care. There was improvement in the techniques of bathing, feeding, and toileting. More patients were out of bed, and social activities were instituted to bolster their outlook on life. Odors decreased noticeably: patient units were cleaner and more functional; and soiled linen was no longer thrown on the floor but placed in a new or improvised hamper.

The pilot study provided for a followup visit to the aide in the nursing home 3 months after completion of training to observe the job performance. Approximately one-half of the teachers made these visits before the termina-

tion of the study. The number of aides in each geographic area who completed the course and the number remaining in the nursing homes at the time of the followup visit are as follows:

<i>Area</i>	<i>Completing course</i>	<i>Followup</i>
Metropolitan -----	57	44
Scatter -----	24	18
Cluster -----	17	14
Rural -----	23	16
Total -----	121	92

Although 121 aides had been trained, only 92 were still employed in the same nursing home; an attrition of 24 percent. The reasons, as stated by operators, are given according to order of frequency: personal reasons, entered practical nurse school, fired, employed in another home, other type of work, and working in hospital.

### **Problems Encountered**

The study was not without its problems. Locating the training centers was difficult and required a great deal of teacher and public health nurse time for visits and telephone contacts. Since no classroom was permanent, it was necessary to obtain equipment on a temporary basis from hospitals, health centers, and nursing homes. Sometimes equipment had to be returned at the end of the class and brought back for the next session.

Although it was agreed that classes should be held on duty time, the aides from all homes with the exception of one, had to attend in the evening after a day of work. Frequently they were tardy, and had not read the assignment, which slowed up class progress.

Supervised practice in the home as a part of training had difficulties too. Most teachers were of the opinion that the actual hours made little difference for if the home was notified in advance, the work was done before they arrived and the purpose of supervised practice in the home was negated. It proved advantageous to go on unscheduled visits to learn how procedures were carried out. The following is offered as evidence: "One home did not use draw sheets on incontinent patients' beds except the day I was to supervise."



fundamentals of general nursing care needed to carry out their job responsibilities. In addition to better working methods, the aides learned work planning and organization, self-protection, and ways of working with others. The operators reviewed the course in terms of improvement in patient care. Fourteen percent observed new or improved techniques; 4 percent, better work organization; and more than 15 percent, interest in the patient as a person. One operator remarked that the training stimulated older workers and improved relationships among aide personnel and between aide and patient. Some commented that the aides seemed happier in their work.

Although the majority of responses were favorable, the negative reactions of 12 nursing aides (or 7 percent) merit serious consideration. They thought the content of the course was too elementary and that it did not equip them to perform the tasks required in the nursing home, such as giving "shots" and catheterizations, administering medicines, and treatments and measuring blood pressure. Likewise, 25 operators, or 45 percent, were dissatisfied with the course because it was too basic for experienced aides: they needed instructions in such things as "shots," first aid, rectal feedings, catheterizations, blood pressure, and medications.

### *The Teachers' Reactions*

Although each teacher was required to attend an orientation course (workshop) prior to conducting aide training classes, many teachers later found themselves confronted with multiple and complex problems unrelated to course content and beyond the scope of the study. The 3-day workshops proved adequate for learning the rapid method of training, fundamental in using the aide manual. But the teachers expressed a need for additional information about the State nursing home program and the nursing home law. They felt their functions should be more clearly delineated and interpreted to nursing home operators. They found teaching and supervision in the home complicated by the operators' request for help with administrative decisions within the home; by the operators' lack of understanding of the rules and regulations as they relate to

standards of nursing care; and by the operators' lack of knowledge of nursing care.

There was need for more assistance in ways and means of improving practice in the nursing home where qualified nursing supervision was lacking and in methods of working with operators who lacked the knowledge necessary to teach and supervise aides. All teachers found it difficult to adhere to their job functions as they understood them and to avoid involvement in nursing home and licensure agency problems.

The teachers felt that their ability to teach and the aides' ability to learn was influenced by a number of factors. The training center, itself, affected the learning situation. It was frequently a long distance from the nursing home, crowded, poorly ventilated, and difficult to reach because of stairs. Very early teachers became aware of the great disparity in education and experience of each class group. The level of preparation influenced the amount of discussion that took place and the speed with which the procedures were mastered. It was sometimes necessary to hold the group back for the slower ones to catch up. The lack of reading ability and comprehension was sometimes embarrassing to the learner. Mixed groups (much and little education and experience) did not prove to be a handicap in all classes or with all teachers. The aides who were quicker to learn tended to help the slower ones.

Fifty-seven percent of the teachers observed a very high fatigue element among the trainees. However, fatigue, limited education, or difference in experience did not dampen the aides' enthusiasm or eagerness to learn. Each aide seemed grateful for the opportunity and took pride in self-improvement. The groups from the beginning to the end maintained a remarkable esprit de corps.

The nursing home situation frequently influenced the aide's ability to practice what she had learned. Among these was the attitude of the operator. In the homes where operators enrolled in the class as trainees, there was a receptiveness to change. In homes where the operators did not attend the class, sometimes there was objection to change: "That is not the way we do it here!"

Teachers found that the aide was often handicapped in performing her duties because of lack

*Not one mother has left the hospital against medical advice since homemaker services were provided in a Texas county.*

# Hidalgo County Homemaker Program

HOWARD JUSTISS



**H**IDALGO COUNTY'S public welfare agency in its child welfare work has the distinction of being the first to provide homemaker services in Texas. We feel these services

answer a vital need in our county. Actually, there are some parts of our homemaker service which we do not like but cannot change immediately because of our financial situation. I want to tell you about some of the weak points as well as the strong; the good and the bad.

Imagine yourself in the southernmost city of Texas, Brownsville at the mouth of the Rio Grande. Travel up the river about 75 miles, turn directly north, and go another 20 miles. You will find yourself in Edinburg, the county seat of Hidalgo County. There are about 16,000 people in Edinburg when all the migrant workers have returned from the north, which usually happens in December. There are about 200,000 people in Hidalgo County. It is a large county and much more thickly populated than some counties I know of in Texas. The chamber of commerce would prefer that I tell you only the attractive things about the region, such as the good, tree-ripened citrus fruits, the beautiful palm trees, the many oil and gas wells, the fine cattle, and the warm winter vacationland;

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*Mr. Justiss is regional service supervisor, State Department of Public Welfare, Hidalgo County Child Welfare Unit, Edinburg, Tex. This paper was delivered at the Round Table Conference on Homemaker Service of the American Public Welfare Association in Washington, D.C., December 4, 1959.*

but I feel that you should know more than these facts because there are some which influence our child welfare homemaker program.

We have a population of 75,000 children, many of them from large families whose parents are poorly paid farm laborers. Wages are from \$4 to \$5 per day when they work.

Because of inadequate diet, lack of medical care, overwork, and poor health standards, incidence of tuberculosis is extremely high. In the South Texas State Tuberculosis Hospital, located in the adjoining county, there were 473 patients on August 31, 1959. Of that number 205, or 43 percent, were from Hidalgo County.

There are great social and cultural differences. Seventy percent of the residents are Latin-American, or Spanish-speaking; others are those who have settled there from the colder regions "up north."

Our child welfare agency is charged with the responsibility of providing protective services to children who are "dependent" and "neglected," as defined by our State laws. This includes the usual provisions for foster-home boarding care, casework services, and adoptions. Homemaker service came to be a part of our program as a result of an experiment with two family situations. I would like to tell you briefly about these two families before we discuss other features of the work.

On a visit to the home of Mr. G in Edinburg, Tex., we might see a family of two girls and three boys getting ready for school. We would be in a small frame house with two bedrooms, a kitchen, and an outdoor toilet. It is a very modest house, but what you would

One purpose of the pilot study was to determine the availability of graduate professional and trained practical nurses in the four geographic areas to teach classes on a part-time basis. Professional nurse recruitment was difficult because of the paucity and lack of interest in teaching on the part of those available. Another aim was to experiment with trained practical nurses as teachers of the course. Their recruitment was an even greater problem, and it was not until the last quarter of the study that one was available.

The study also supplied an estimate of the cost of training each aide. The estimates were based on salaries, travel expenses, and per diem fees of teachers and coordinator, and supplies, but did not include rent, utilities, laundry, and similar items. Roughly the cost was approximately \$416.67 for each class, or \$54.35 for each nursing aide trained.

## Discussion

The pilot study included only 16 percent of the 454 licensed homes in the 1957 Oklahoma State Inventory, leaving 383, or 84 percent, presumably in need of training assistance. Since the 184 nursing aides trained were recruited only from nursing homes, the course was a type of inservice training. No consideration was given to preservice training. Within the State there also are convalescent rest homes which, according to the State Advisory Committee, have patients requiring all levels of care and employ nursing aides. It may be assumed that nursing aides in all three types of homes could benefit from training which would be reflected in improved patient care.

The 1958 Oklahoma State Inventory of Homes (all types) showed a nursing staff of only 14 graduate registered nurses, 35 licensed practical nurses, and 1,200 nursing aides giving nursing care to patients. In the study sample of 71 homes no professional nurses were employed. Therefore, no one with professional competence was available to assess patient needs, assign tasks, or supervise nursing care.

There is no educational institution in Oklahoma where nursing home operators can obtain training in administration of a nursing home or nursing services, the primary therapy in the nursing home. Also, there are no qualification requirements (educational or physical) or definitions of functions for either the nursing home operator or the nursing aide. This means that ways of identifying what operators and nursing aides should or should not be doing are currently unavailable.

During the study teachers repeatedly called attention to the absence of supervision of nursing practice, lack of standards of nursing care, lack of procedure manuals, and the lack of equipment for the care of patients in nursing homes which affect the quality of nursing care. It was felt that both operators and aides could be helped considerably in job performance through special training. The high rate of turnover in nursing aide staffs emphasized the need for regular and continuous offering of such training.

It was recognized that the effectiveness of aide training programs depends to a great extent on some one person to provide the leadership and to coordinate the program's activities and interests of the community and participating groups. Adequate staff and sufficient time for teaching and followup are essential. In addition, there should be a definite source to provide financial support in the training programs.

It has been demonstrated that such training programs can contribute to improved patient care but that many related problems remain unsolved and require further study.

*The manual, How To Be a Nursing Aide in a Nursing Home, by Dorothy E. Recsc, may be obtained from the American Nursing Home Association, 1346 Connecticut Avenue NW., Washington 6, D.C., at \$2.50 a copy.*

## REFERENCE

- (1) Public Health Service: Nursing aide instructor's guide. PHS Pub. No. 324. Washington, D.C., U.S. Government Printing Office, 1953.

makers to care for 48 families including 236 children. Most of these children would have required boarding care for long periods of time in foster homes had this arrangement not been available. I need not point out the advantages to each child of remaining in his own home, but another factor made sense to our commissioners—the homemaker services cost less than foster-home boarding care. Homemaker services for the G family for 5 years have cost the county about \$6,240. Foster care for these five children for the same length of time would have cost about \$12,000, and would have included no help for Mr. G himself.

We pay our homemakers \$20 to \$25 per week. Usually they are widows with no family responsibilities, neighbors to the family in distress, and acquainted with the children. They love children and accept willingly the household duties required in caring for them. Also they are familiar with financial deprivation and can manage well on limited incomes, inadequate housing, and few facilities. (One homemaker, who was required to live with a family of small children in a house with only one bedroom, slept on an Army cot in the lean-to kitchen every night for several months.)

And they are interesting people. For example, one lady is in this country on a passport. She was brought up on a ranch in Mexico, lived several years in Laredo, Tex., where her father was a merchant, and later became a professional dancer and actress in this country. She came to Texas from Mexico a few years ago to earn money for the care of her invalid husband. He was a professional bullfighter who was gored by a bull. He now lives with his mother in Monterrey, Mexico, while his wife works for us as a homemaker to support him. She is the "life of the group" at our regular meetings for in-service training.

One caseworker assumes responsibility for all families receiving homemaker services. For 2 years now, we have held regularly scheduled meetings of our caseworkers, to add to their training and insight in helping these families. We use our home demonstration agent, the chief county health nurse, and our own staff in teaching such subjects as general child care practices, recognition and care of childhood diseases, preparing balanced meals on low-income budget,

mending clothes and sewing, budgeting and buying both foods and clothing, and personnel policies.

We have used a total of 57 homemakers in 48 different family groups. The family situations which required homemaker services were:

- In 24, or 50 percent, the mother was hospitalized because of tuberculosis. In two of these homes, both parents were hospitalized at the same time, and the homemaker lived with the children on a 24 hours a day, 7 days a week, basis.

- In four homes, the mother was mentally ill. In most cases, she was hospitalized.

- In four homes, the mother had died. In one of these, the father had also passed away, so the homemaker lived with the children until permanent provision could be made for them.

- In four homes, the mother had cancer.

- In 12 homes, either there were other illnesses, the mother had abandoned the children, or other circumstances required the mother's absence for long periods of time.

The average length of stay of the homemaker to aid these 48 families has been 7 months.

Our homemaker program has certain unique features. Homemakers are selected usually from the immediate neighborhood or town where the family lives. In many instances, she is known to the children and is a friend of the parents. Hidalgo County is a large county, and even though the northern section is ranch country and sparsely settled, other sections, covered by small citrus groves, are thickly settled. There are 10 small towns or distinct communities with populations of from 3,000 to 30,000. Because many homemakers refuse to work in an adjoining community which may be 5, 10, 15, or 25 miles distant from their own homes, each homemaker is employed for the duration of a specific case. We have been able to persuade some, however, to take other cases, even if it meant travel.

Homemakers are not employed by the month or by the year or permanently, but for the duration of need in a particular family. The first one employed is in the same home after nearly 5 years; others remain 6 months to 1 year.

We do not use homemakers for very short periods, such as a brief hospital stay of a mother. I think we should, but it takes so long

expect for a rent of \$25 per month. The youngest child, a boy 6 years old, probably would be asking the 50-year-old lady in the house, whom he calls "Tia" or aunt, to brush his hair. Or this same motherly lady, dressed in a plain, striped seersucker uniform, might be helping 12-year-old Mary pack her school lunch. The father, Mr. G, is not there because he left about 7 a.m. to do odd jobs on a ranch nearby. He is 65 years old but he likes to supplement his Aid to Dependent Children check of \$96 per month by helping his "patron" repair fences, oil windmills, repair cattle guards (that's the kind of gate you run over the top rather than get out of a car and open), or anything else there is to be done. He does these odd jobs for \$1 or \$5 per day. The lady helping the children get off to school is our first homemaker. She has served continuously in this same home since January 24, 1955.

The situation of the G family came to the attention of the child welfare department in October 1953, when the mother became mentally ill and we had to place the children in foster-home boarding care. The mother was hospitalized, diagnosed as schizophrenic reaction, catatonic type with mental deficiency. With the prognosis poor, we decided it was unfair to keep the children in foster-home boarding care. Arrangements were made to return them to the father, Mr. G, who could use his ADC check of \$96 to pay a housekeeper to help him with the children, who were then aged 2, 5, 8, 10, and 11. This was a poor arrangement: Mr. G offered only \$1 a day to this helper. There was no washing machine. She complained of the two-burner kerosene stove and the fact there was no food except beans. She knew that this was not what a 2-year-old child needed. Mr. G fired her, only to find the next one just as complaining and disagreeable. When he did find someone to suit him, she quit because Mr. G did not want to pay her. "After all, I am furnishing the food," he said.

On January 24, 1955, the department employed a warm, motherly widow to work with Mr. G and his children during the days only. The children knew her because she had lived in the immediate neighborhood. Also, she knew the children's mother and was able to help them

understand and talk about what had happened. Each year the mother returns from the hospital on furlough to visit her family, but each time her peculiar behavior makes it evident to the children, the homemaker, and to Mr. G that she is too ill to remain at home.

In the meantime, our homemaker has taught the oldest girl how to cook, to sew, and to keep house. Plans are for this girl to take over the responsibilities of the home and to close the case during 1960, after 5 years of continuous service.

Our second homemaker was hired in October 1955, in an effort to protect five children, aged 2 through 15 years, from exposure to tuberculosis from their mother. Mrs. B, the mother, resisted hospitalization. Even though she went to the hospital several times, she would return home each time against medical advice. Enforced isolation of the mother in her own home, with a homemaker to care for the children, was the only alternative to foster-home boarding care for the children. When Mrs. B began hemorrhaging, she agreed to return to the hospital. Even then, she came home in 6 months for an "unauthorized" visit just to "see how the children were getting along."

The homemaker was able to give continuous 24-hour care to these children for 6 days each week, but not without problems. The father had always depended upon his wife to discipline the children, but he resented the homemaker doing it and he could not do this himself. As a day laborer in the fields, his income was insufficient even with ADC and this eventually was denied on the basis that a caretaker was supplied by the department. The homemaker was an excellent cook but, as a result of the ADC denial, there were times when there was little or nothing to cook. The homemaker accused the father of making "advances."

These issues were settled skillfully by the caseworker.

This same homemaker remained in the home of Mr. B's family until the mother was discharged after 3 years in the hospital.

Our program has grown and improved since those first few months of blundering and experimenting. At one time in 1959, we had 14 homemakers caring for 14 such families. In the past 4 years we have used a total of 57 home-

# The Challenge of Disability

SURGEON GENERAL LEROY E. BURNEY

**T**HE CHALLENGE of disability confronts every physician, whether he is a general practitioner or specialist, in private practice, in medical education, in public health, or in public medical care. It confronts members of all the health professions, as well as public and private welfare agencies. It confronts governments at every level, as well as legislatures.

The burden of disability falls with greatest severity upon disabled individuals, of course, and upon their families. But it affects every citizen, whether as employer, taxpayer, or community leader.

How does our society view disability? There is no doubt that in the United States disability is viewed with compassion, and as a burden which all of us must share with the disabled. Our programs to alleviate the financial burdens of disability and our rehabilitation programs for crippled children and disabled adults are the best evidence of our concern.

But I want to delve deeper into our attitude toward disability. I have observed wide variations in the kinds of services offered to disabled individuals in different countries. The underlying attitude, however, is very much the same. Disability is viewed by all societies as an accomplished fact; an unavoidable burden to be accepted—as our forefathers accepted all disease—as an act of fate or of some malevolent demon.

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*Dr. Burney, Surgeon General of the Public Health Service, delivered this address at the Governor's Institute on Rehabilitation, Honolulu, Hawaii, January 11, 1960. The paper on page 298, by Dr. T. Nishigaya, who is in private practice in Hawaii, was presented at the same meeting. Dr. Nishigaya's paper also appears in the March-April 1960 issue of the Hawaii Medical Journal.*

To be sure, in countries like our own with highly developed medical skills and ample economic resources, there is a strong effort to alleviate disability. But in America and elsewhere we tend to apply the remedy after the fact—usually too long after. We have yet to develop an attitude which views disability as preventable.

If public health has a particular contribution to make in the field of rehabilitation, I believe that it is to foster an attitude of prevention. Prevention has been the first principle of public health since the birth of the modern movement. The earliest focus of attention, of course, was the prevention and control of infectious diseases. Over the years preventive measures applied by public health agencies and private physicians have averted an inestimable amount of prolonged disability, simply by the control of infections which left many survivors with crippling aftereffects. Many physicians in this audience will recall the frequent heart damage due to diphtheria, syphilis, and rheumatic fever. Most recently, the prevention of paralytic poliomyelitis, through the use of an effective vaccine, is rapidly reducing the accumulation of severely disabled persons due to that cause.

Today, the public health profession as a whole is as much concerned with high disability rates due to chronic conditions as it was with high mortality rates due to diphtheria and typhoid fever 60 years ago. The objective of this concern is to prevent the occurrence of chronic diseases, accidents, and dangerous environmental exposures if possible; if not, to prevent their disabling consequences.

Our Federal-State programs of public health and rehabilitation have one common objective; namely, reduction of the social and economic consequences of disability. Yet there are differ-

to recruit, get social security cards and health certificates, and to get to know the new homemaker, the mother is back at home before the homemaker is ready to work.

Homemakers are used primarily in situations where there are several children who would be dependent, neglected, and require boarding care in a foster home if homemaker service were not available.

We see this type of care for family groups as better for the children. First of all, it eliminates at least some of the trauma of separation. It keeps the father involved with his children's care at least at night and on weekends. The children need at least one parent and a closer family relationship than would be possible with boarding care.

It provides a type of care which the ill mother can accept more readily and thus it permits her to accept hospitalization. Many mothers have told us that they would stay in their home and die, rather than see their children "sent away" to some stranger's home. Of course, many factors encourage this attitude such as fear of the hospital—the unknown, and fear of the risk of leaving the husband.

We might mention a mistake we made early in the program. We hired some young, unmarried women who were alert and quite attractive. You can see how this failed. Even if things did go well at home, the ill mother in the hospital became jealous and left against medical advice in order to protect her place in the family. Now we seldom employ a homemaker who is not already a grandmother, and, as pointed out previously, one who is known and accepted by the mother. (Incidentally, the average age is 50 years.) We have given status to our homemakers in the eyes of the community and the children they serve by supplying each homemaker with plain striped seersucker uni-

forms with insignia. The insignia have "Child Welfare" at the top and "Homemaker" at the bottom. In the center is embroidered the face of a child. The insignia were handmade by a group of nuns in Mexico.

To justify the use of uniforms at county expense, I thought my best argument, stated briefly, was: "This uniform, like that of a nurse, sets these neighborly ladies aside as being officially in the home and not just another woman who has taken the place of the mother who is ill."

Casework services are provided when a homemaker is used. The caseworker has the difficult task of helping the father keep his place as head of the house by providing the groceries as well as giving the love and care he should to the children. She must also help the children to understand what has happened to the family. She keeps the hospitalized mother informed about the children with visits, letters, and pictures. There has not been a single instance of a mother returning home from a hospital against medical advice since our homemaker program has become well established. The homemaker, in planning the budget and in working through disciplinary problems with the father, has the aid and support of the caseworker. The welfare worker is, in a sense, the homemaker's employer, yet she must look to the father as the head of the house who provides the funds (usually ADC) for the children.

Our homemaker program is far from perfect, but it is serving a definite purpose for us in Texas by preserving families and saving them from having to go to foster homes. We experimented with needful families and found a partial solution in homemaker service. I hope others might be able, not to duplicate our program, but to apply those parts of it which might enable them to serve children better in their States and communities.

surviving today in a tragic sort of half-life. By very simple measures instituted promptly in the home or in the hospital, the majority of stroke patients can recover function within a short period of time. There is ample clinical evidence that more than 80 percent of patients who survive a stroke can become ambulant within two months with appropriate clinical management. The longer the physician waits to institute these measures the longer will the patient be disabled, and the more difficult it will be to restore function.

As the Nation's families and communities struggle with mounting burdens of long-term disability and dependency, are there no alternatives to high-cost care in hospitals and institutions? Fortunately, some States and communities have experimented and found that much disability can be prevented, and that many long-term patients can be cared for in their own homes, often more satisfactorily than in an institution.

The Georgia State Health Department, for example, in cooperation with the State Heart Association, medical organizations, and the Public Health Service is conducting a special program for stroke patients. There are approximately 40,000 survivors of strokes in the State. Often these patients have other serious medical problems and fill hospital beds over long periods of time. Prolonged bed rest, dependency, and speech difficulties generate severe disability, as well as psychological problems in these patients. Their disability creates social and economic difficulties for their families.

The Georgia stroke program includes education of the medical and nursing professions in the early use of physical therapy and early ambulation of stroke patients. A demonstration clinic is being conducted at Grady Memorial Hospital, the teaching hospital of Emory University Medical School. Here the stroke patients are seen on an outpatient basis and appropriate physical therapy is prescribed. The family is responsible for carrying out the therapy in the home. A public health nurse visits the home periodically to instruct the family and to supervise performance of the recommended procedures. A team composed of a physician, a physical therapist, and a public health nurse is

available to give intensive training in these procedures to physicians and nurses in local communities.

Another program, even broader in concept than that of the Georgia stroke program, is of interest. This is a home care program for disabled persons conducted in a rural county in North Carolina. It provides medical consultation, nursing, social service, physical and occupational therapy, health and nutrition education, orthopedic equipment, medicines, and sick-room supplies as needed. Residents of the county are eligible regardless of age, sex, or financial status, providing they possess a potential for self-care or self-support. All patients must be referred by a local physician and must remain under his care while receiving services of the program. The Public Health Service is co-operating with State and local agencies in this project.

A specially significant feature of this program, I believe, is its communitywide coverage. So long as community services are restricted to persons dependent on public welfare or to individuals with a potential for employment, medicine and public health will be neglecting the majority of the people needing care. In most rural areas, services such as are provided by this program have to be created. They are not available outside the hospital and many rural hospitals do not have the full range of services required for medical rehabilitation.

I have been told that the first patient to apply for the services of this home care program was a disabled woman whose financial resources are ample to support her for the rest of her life. She wanted to live in her own home rather than in some distant institution. Her inner drive for an active life sought the means for recovery. Her physician could not possibly provide all the services and facilities she needed to achieve this goal. Yet before the community home care program was established, there was no way he could bring the nursing service and special therapies to her bedside.

A few years ago, the Commission on Chronic Illness listed 32 services which patients with long-term conditions are likely to need at various times. While the average physician has his

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ences in approach. Public health strikes primarily at the causes of disability and hence must seek its opportunities for prevention among supposedly healthy individuals and in the community environment. Rehabilitation strikes primarily at the effects of disability and must seek its opportunities among individuals who are known to be disabled. Both programs are constructive at the core, in that both seek change for the better: change in health status for the whole community, change in the disabled status of the individual.

This determined effort to bring about change is a dynamic force in public health and rehabilitation. It is the force, I believe, which has brought the Public Health Service and the Office of Vocational Rehabilitation into a closer relationship during the past year. We realize more than ever before that our country cannot solve the medical and community service problems involved in disability by piecemeal approaches. Hence we are striving to plan and work together, so that the Service and OVR may more effectively mobilize their resources in a concerted attack on the causes and on the effects of disability.

Disability is a medical problem first and foremost. The success of the attack, therefore, depends primarily upon the alertness and action of each physician. As a social problem, disability can be alleviated by financial support of the disabled, by social services, vocational counseling and training, and placement in employment. It cannot be solved by these means, however, unless everything possible has been done to solve the medical problem.

The preventive approach to disability views the medical solution as beginning the moment a physician sees a patient whose condition obviously or potentially will lead to disability. The medical solution of disability continues as long as the patient needs medical services to sustain his highest potential of active life. This is the central fact which demands a broader view of rehabilitation than has been generally accepted in this country up to the present time. And it is the fact which demands the development of community medical services and the active participation of all physicians.

Rehabilitation services too often are planned around the problems of patients with static con-

ditions—the paralytic, the amputee, the blind. Our Federal and State laws related to employee compensation, social insurance, public assistance, and vocational rehabilitation tend to support this view of rehabilitation.

Another handicap to the medical solution of disability is the emphasis on the potential for competitive employment in public and some private rehabilitation programs. This criterion does not take into account the needs of elderly retired persons for rehabilitation services, nor of many severely disabled younger persons who, for one reason or another, do not present a significant potential for employment.

### **Changes in Community Needs and Services**

The greater efficiency of medicine today warrants a much more flexible response to the challenge of disability. I should like to discuss with you briefly a few of the changes in recent years which focus attention on the role of medicine and public health in rehabilitation.

I need not summon an array of statistics to demonstrate the changes in the patterns of illness. Acute conditions, excluding injuries, account for smaller proportions of the Nation's mortality and prolonged disability. Chronic conditions and severe impairments are the major health problems. There are more older people in the population, and the incidence of chronic conditions increases with age.

Of equal significance, a larger proportion of acutely ill persons survives the initial attack or the injury which first brought them to the physician's attention. Delay in the institution of restorative medical services until the patient's condition has stabilized often means waiting until he has become "permanently and totally disabled."

The initial heart attack, for example, proves with increasing frequency to be the first episode of many. If the physician does not have in mind the prevention of disability from the outset, he may add another "heart cripple" to the increasing number of cardiac patients who are needlessly retired from active life by reason of their disease. Early return to an increasingly active regimen under careful medical supervision will avert many such cases.

There are untold numbers of stroke patients

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## *The Physician and Rehabilitation*

The practice of rehabilitation for any physician begins with the belief and basic philosophy that the doctor's responsibility does not end when the acute illness is ended or surgery completed. It ends only when the individual is re-trained to live and work with what he has left. This basic concept of the physician's responsibility can be achieved only if rehabilitation is considered an integral part of medical services.

The physician has always practiced some aspects of rehabilitative therapy though he may not have thought of it as such.

*Traditionally, the saving of human life and the relief of suffering were his primary goals. Those individuals disabled by congenital defects, disease, injury, or infirmities of age were accepted as having suffered the expected consequences of their difficulties and were regarded as hopeless.*

Today, the fact that life is preserved does not necessarily mean that a good cure has been obtained. The diagnosis and treatment are often so absorbing that there is increasing danger of focusing too much attention on the disease without regard to the person as a whole. The true significance of rehabilitation and its real distinction from preventive and curative treatment rest on the conviction that both lay and medical resources can be used to prevent and treat those disabling complications.

Rehabilitation is every physician's business. Experience has shown that much of all rehabilitative processes can and should be done by the practitioner responsible for the patient's primary medical care. To meet the needs of the more difficult cases, the physician can refer patients to rehabilitation centers where a team approach can be applied, using the special skills of specially trained physicians, physical and occupational therapists, social workers, speech and hearing therapists, nurses, vocational counselors, psychologists, and prosthetics specialists.

These co-professional personnel act as members of evaluating and therapeutic teams. However, one person must be responsible since the patient cannot

effectively be treated by committees. This is the physician's responsibility. Medical guidance is necessary for rehabilitation to have purpose, for, regardless of the type of disability, the responsibility of the physician to his patient cannot end when the acute illness or injury has been cared for. In addition, because of the high prevalence of chronic illnesses and their tendency to be prolonged, the basic elements of early detection and adequate medical care must be complemented by rehabilitation. These services should continue as long as the patient can profit from them.

*We must not lose, by neglect of the social and emotional life of the patient, those controls which are not affected by the illness. Custodial institutional care contributes to a deterioration of the patient far beyond what is inherent in the development of the disease itself. It is therefore essential that physically degenerative and socially degenerative processes that diminish the individual's capacity for self-maintenance be prevented, and that we direct efforts at the restoration of the capacity of the individual to maintain himself. We must protect the health of the patient though we cannot cure that part of him which is specifically diseased.*

The patient must maintain some goal to his activity. This may mean a return to the status of self-help. It may mean employability, the traditional goal of rehabilitation efforts. Productivity has more than an economic connotation. In any case activity has an important social meaning in terms of the status of the individual.

We must emphasize that we are not dealing solely with physical disability but we are concerned with a person. We must consider and evaluate the patient's physical capacities and consider his vocational, psychological, and social status since these are important factors in his eventual social integration.

Medical care is not complete until the patient has been trained to live and to work with what he has left.

—T. NISHIGAYA, M.D., *Honolulu, Hawaii*

patient in the hospital, most of these services, plus the basic provision of bed and board, are made available as a matter of course. He takes such services for granted, scarcely realizing that nowhere else in the community will his medical decisions be so scrupulously put into practice. The physician is responsible for making the diagnosis and prescribing the treatment, but an army of professional and ancillary personnel carry out his orders—in the hospital.

These so-called "supplementary services," and the men and women who render them, now play a more important role in the delivery of medical services than the physician himself. In 1900, three in every five professional health workers were physicians; in 1950, only one in five were physicians. The problem that confronts the physician, as keyman in combating disability, is how to marshal these supplementary services in effective management of his patients—in his office and in their homes.

Public health, with its community-oriented approach, is in a strategic position to help resolve this dilemma of modern medical care. Chronic disease, mental disorders, and the problems of aging may be regarded as the "growing edge" of both prevention and rehabilitation. The benefits from application of the wealth of knowledge in both fields are still largely potential. They will remain largely potential, I fear, until all physicians—in private practice, in administrative positions, and in hospitals—recognize and act upon their responsibilities in these fields. I place this burden on our entire profession for the simple reason that these are medical problems, and the action of other groups in health related services stems from the physician's initiative.

What nurse, for example, will begin the measures which will restore function in a stroke

patient—unless the attending physician has specifically prescribed these measures? What personnel manager or supervisor will properly adjust the cardiac patient's work schedule—unless the physician has clearly prescribed the patient's 24-hour schedule of working and living activities? What local health department will allocate its often meager resources to home services for the disabled—unless the medical society endorses such programs, and practicing physicians use the services?

I have tried to present to you this evening some of the changes that are affecting medicine, public health, and rehabilitation. I have shared with you some thoughts on the challenge of disability and how we may meet it with greater confidence. It will not be easy to stimulate a fresh view of disability as a preventable evil. Even with the great scientific advances, the medical solution of disability will not be easy. It is up to us to try.

A first step is for men and women in the fields of medicine, public health, and rehabilitation to get to know each other better. Better understanding of one another's aims, methods, needs, resources, and problems; better communication—these will lead us into better ways of working together for the goals we all want to attain.

Let us also work together for the patient in his community. This means that we must work toward better organization of community services, better balance in our programs, earlier application of preventive methods in the care of all patients. We must do so if our material resources, with a shrinking dollar and a shrinking supply of competent personnel, are to suffice in making a significant impact on disability.

# Signs

and

# Symptoms

## *of trends in public health*

A newly opened \$1½-million addition to the University of Michigan School of Public Health doubles its teaching and research facilities. Two 4-story wings have been attached to the original building, erected in 1913.

Laboratories for research in epidemiology, industrial and radiological health, and sanitation are being housed in the new wings. In addition, there are multipurpose lecture rooms and workshops, radiation laboratories with lead-lined walls, library facilities, and a 2-story laboratory for testing large equipment.

The new structures, financed in part with funds from the Public Health Service and the Kellogg Foundation, house research equipment valued at one-quarter of a million dollars.

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Accidental release of 3,000 pounds of hexavalent chromium to the Raisin River in Michigan imperiled several municipal water supplies last December. The State Health Department and Water Resources Commission alerted towns to close intakes at water plants as the slug approached. They stayed shut for 12 hours.

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Chemical and biological research in water, sewage, and industrial wastes at Ohio State University will expand in a new \$180,000 Water Resources Center, scheduled for completion May 1960.

The facility, now under construction, was financed by a grant from the Public Health Service and State appropriations.

Homemaker Service, a community program administered by the Family Service Association of Greater Boston, has a staff of 110 homemakers who last year served more than 1,200 families. Forty-four homemakers receive a guaranteed annual wage; the others are paid for the amount of time worked. Mrs. Elinor McCabe, the director, and her social workers receive and study all applications and place and supervise the homemakers.

Local departments of public welfare in the Greater Boston area purchase this service for selected public assistance families at a rate of \$12.25 a day. The local department considers this expenditure an administrative expense which is outside the area of Federal financial participation. Through the use of this community service, many public assistance families are able to remain together or continue to live in their own homes when illness or disability occurs.

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At a cost of more than \$5 million, the Institute for Muscle Disease has been completed in New York City.

"To increase our knowledge of muscle, to understand the mechanisms by which muscular dystrophy and other muscular disorders arise, and to develop treatments for these conditions," is the primary objective stated by director Dr. Ade T. Milhorat.

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In Keene, N.H., 13 cases of typhoid fever were traced to a single lumberman, a carrier, working in the watershed. Chlorination had been suspended.

Per capita health expenditures from tax funds in Connecticut ranged from \$1.20 to \$2.25 during 1958, it is reported in the December 1959 issue of *Connecticut Health Bulletin*. Broken upon population groups by towns, the statistics show that health expenditure on a per capita basis rises with increase in town population.

Expenditures by individual towns within population groups, however, differ markedly. In towns under 1,000 in population, for example, with an average per capita expenditure of \$1.20, one town spent 26 cents per capita while another spent \$3.

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Quantities of strontium-90 in American water courses sampled weekly by the Public Health Service in 1959 ranged from 0.0 in the first and second quarters at Alsea, Oreg., to an average of 4.8 micromicrocuries per liter in the third quarter at Chattanooga, Tenn. The maximum permissible for lifetime exposure of the general population is 80. Early readings at Hoover Dam were reported as relatively high but a recheck established a low rating of 0.9.

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Indianapolis was influenced by the etiological relationship between housing and mortality in enacting an up-to-date housing ordinance, as drafted by the committee on the hygiene of housing of the American Public Health Association, according to Dr. Henry J. Nester. He said, "I have found it particularly interesting to note that you have a lower force of mortality in those parishes with higher percentage of houses provided with toilets, baths, and hot and cold running water."

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Conservation of hearing in Madison County, Miss., is the object of a public program to screen hearing defects among about 9,000 school children, with the use of an audiometer donated by the local Lions Club, which also contributes to the operator's salary.

Funds for the correction of identified hearing defects in indigent children will be supplied by the Lions Club and the School Health Service.

*A comparison of the rates of native and foreign-born admissions to public mental hospitals in Ohio during a 4½-year period tends to support earlier findings that migration rather than foreign birth per se is significant in the comparative incidence of mental disease.*

## Immigration and Insanity

BEN Z. LOCKE, M.S., MORTON KRAMER, Sc.D.,  
and BENJAMIN PASAMANICK, M.D.

**I**NFORMATION on mental illness among the foreign-born is sparse and very little is current. Indeed, in a recently published book the data in the section on nativity pertained to the period 1917-34 (1). Also, aside from gross national data derived from the decennial census of institutions, most of the detailed available information on this subject concerns admissions to mental hospitals in but three States: Minnesota (2), Massachusetts (3), and New York (4-6).

This paper reviews these early data and presents the rates at which native and foreign-born were admitted to Ohio public mental hospitals during the period 1948 to June 30, 1952.

### Historical Review

In the introductory remarks of the 1880 census (7) it was stated that "The extraordinary ratio of insanity among the foreign-born has attracted wide attention." However, this report pointed out that "the question of age has a bearing upon the comparative num-

ber of the insane who are of native and of foreign birth" and that "the difference disappears, in large measure, when, instead of comparing the number of insane with the total population, we compare it with the population above the age at which insanity ordinarily occurs, that is to say above the age of 15 years. I have here put the margin very low." As a result of this simple but incomplete correction for age it was shown that "instead of the foreign insane being 2½ times as numerous, in proportion, as the native white insane, they are about 50 percent more numerous."

The 1910 census (8) also pointed out that while "the foreign-born have an unduly large representation in insane asylums" the ratios "if regarded as an index of the tendency to insanity among immigrants as compared to the native population are misleading." It then states that "the age difference probably goes further than any other factor toward explaining the contrast between the native white and the foreign-born white in respect to the proportionate numbers admitted to hospitals for the insane." Other factors it mentions as relevant are sex ratios, geographic distribution, and the degree of concentration in cities besides the migration factor and the concomitant consequence of a changed environment involving "new physical, economic, and social conditions."

However, in analyzing mental disease admission rates in Minnesota for the four decades

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from 1889 through 1929, Ødegaard reported that the standardized first admission rates among the Norwegian born were significantly higher statistically than the rates for the native-born (2). In his analysis, Ødegaard stressed the importance of initial selection and the problems of assimilation, but for each decade analyzed the difference in the standardized admission rates between the two groups decreased.

In presenting his findings regarding nativity and mental disease in Massachusetts, 1917-33,

Dayton also stated that "Early reports on the relative incidence of mental disorder in the foreign-born and in the native-born favored the native-born in a very decided manner. Later it was discovered that the greater part of the observed differences between the two nativity groups was statistical rather than actual . . ." (3).

The Massachusetts data, in which age was fully considered, showed the foreign-born to have higher first admission rates than the native-born. But as Dayton pointed out, the

**Table 1. First admission rates per 100,000 to Ohio public mental hospitals of white persons, by age, sex, nativity, and residence, all diagnoses, 1948 to June 30, 1952**

Age (in years)	White male							
	Metropolitan				Nonmetropolitan			
	Native-born		Foreign-born		Native-born		Foreign-born	
	Num- ber	Rate	Num- ber	Rate	Num- ber	Rate	Num- ber	Rate
Crude total.....	7, 357	95. 5	1, 352	151. 9	4, 015	91. 4	189	159. 5
Adjusted total <sup>1</sup> .....		98. 2		119. 4		90. 8		114. 1
10-19.....	360	27. 1	6	62. 9	185	20. 9		
20-29.....	1, 368	83. 2	28	98. 7	597	74. 3	4	88. 6
30-39.....	1, 481	92. 8	79	142. 5	709	93. 1	13	166. 6
40-49.....	1, 428	113. 7	136	92. 5	772	120. 3	22	124. 5
50-59.....	980	103. 8	296	111. 1	589	110. 6	37	132. 4
60-69.....	782	133. 2	430	166. 1	502	117. 8	45	131. 4
70 and over.....	958	276. 3	377	303. 7	661	192. 3	68	279. 6

Age (in years)	White female							
	Metropolitan				Nonmetropolitan			
	Native-born		Foreign-born		Native-born		Foreign-born	
	Num- ber	Rate	Num- ber	Rate	Num- ber	Rate	Num- ber	Rate
Crude total.....	6, 469	77. 9	1, 035	124. 7	2, 879	63. 1	116	106. 9
Adjusted total <sup>1</sup> .....		77. 6		111. 3		62. 9		98. 4
10-19.....	249	18. 4	7	84. 3	110	12. 7	2	103. 4
20-29.....	1, 178	64. 8	31	68. 5	486	57. 9	6	59. 7
30-39.....	1, 472	86. 8	97	157. 4	624	79. 0	10	110. 4
40-49.....	1, 110	84. 7	159	104. 9	525	79. 9	19	120. 1
50-59.....	855	86. 0	240	104. 7	388	69. 3	20	77. 7
60-69.....	662	98. 7	208	99. 6	347	75. 6	24	97. 7
70 and over.....	943	202. 0	293	234. 2	399	101. 2	35	163. 6

<sup>1</sup> Age-adjusted rates based on total native-born Ohio population.

NOTE: The numbers of admissions are for the entire 4½-year period; the rates are on an average annual basis.

Figure 1. Average annual first admission rates to Ohio State public mental hospitals, for white males, by age, nativity, and residence, all diagnoses, 1948 to June 30, 1952

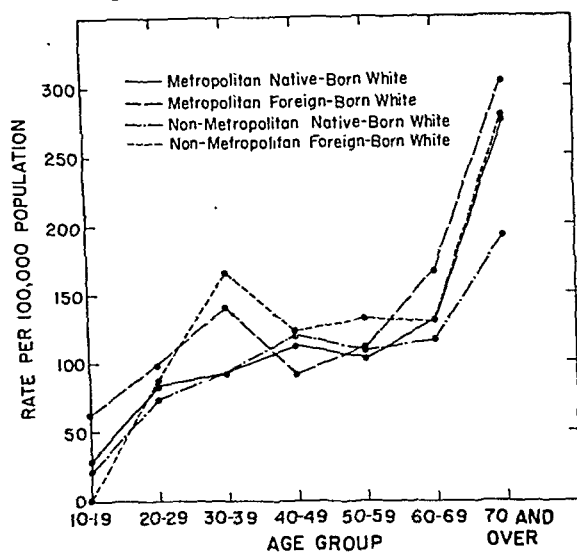
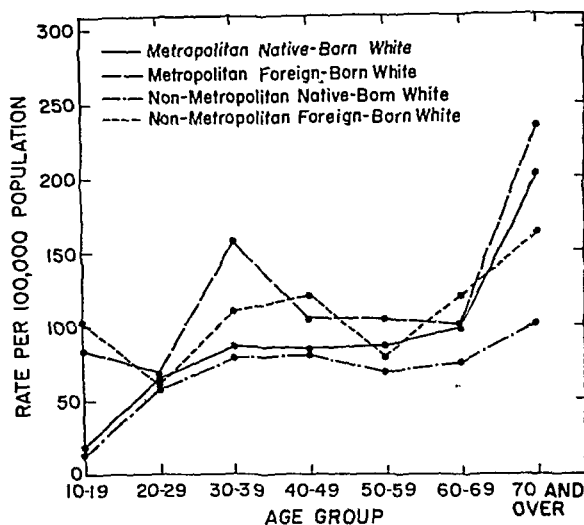


Figure 2. Average annual first admission rates to Ohio State public mental hospitals, for white females, by age, nativity, and residence, all diagnoses, 1948 to June 30, 1952



native-born had certain protections which might have tended to keep him out of the hospital. The foreign-born was not only handicapped by the absence of these protective mechanisms (familial, social, and economic) but had language difficulty as well. Another factor, although a minor one, was the greater use of private facilities by the native-born.

Malzberg, in his study of first admissions to all institutions for mental disease in New York State, 1929-31, found "that even after age differences had been eliminated, the foreign-born still had a higher rate of first admissions than the native-born, though the excess was much less than that derived solely on the basis of crude rates" (4). However, after reviewing the data from several aspects he comes to the general conclusion that the available data indicate few, if any, differences in the relative incidence of mental disease among native and foreign whites in New York State that cannot be accounted for adequately on the basis of environmental and age differentials.

In a similar study involving 1939-41 data, Malzberg and Lee minimized the importance of the overall differential of 11 percent among males. They took the 21 percent difference in age standardized rates for total psychoses in

females as evidence of an important difference in the patterns of first admissions by nativity of white females (5).

Based on the 1939-41 data, Malzberg stated that a population native to a given environment has lower rates of mental disease than the population in the same environment which is of foreign birth (6). This conclusion was qualified by the statement that the more we compare the two populations on a comparable basis, the greater is the approximation in rates of first admissions.

### Ohio State Study Results

According to the 1950 census, 5.6 percent of Ohio's population was foreign-born, and 19 States had larger percentages (9). New York had the highest percentage foreign-born, 16.8; Massachusetts had 15.2 percent; and Minnesota 7.0 percent. In Ohio, the 1950 foreign-born white population numbered slightly over 440,000.

During 1948 to June 30, 1952, there were 2,692 foreign-born white first admissions to the Ohio public mental hospitals (aged 10 and over). In the same period, 20,720 native-born whites were admitted. As shown in table 1, the crude rates for the foreign-born are much



higher than those for the native-born. Age, the same factor to which attention was called in the 1880 census, appears to account for part of the disparity in these crude rates. In Ohio, for example, the median age of the foreign-born and native-born whites, was, respectively, 42 and 19 in 1880, 39 and 24 in 1910, and 57 and 30 in 1950. Nevertheless, when the 1950 rates were adjusted for age, the rates remained higher for the foreign-born, as would be expected since figures 1 and 2 and table 1 show

that for most age groups the rates were either at the same level or higher for the foreign-born.

In the New York State study, the differential in rates between the foreign-born and the native-born females was such that Malzberg and Lee stated: "The poorer showing of all foreign-born females relative to natives tends to substantiate Odegaard's hypothesis that females make less satisfactory adjustments to migration than do males, or alternatively that female immigrants are not as well 'selected' as are male

**Table 2. Number of admissions and first admission rates per 100,000 to Ohio public mental hospitals for native-born, by age, sex, color, and place of birth, all diagnoses, 1948 to June 30, 1952**

Age (in years)	Native-born males							
	White				Nonwhite			
	Ohio		Other States		Ohio		Other States	
	Number	Rate	Number	Rate	Number	Rate	Number	Rate
Crude total.....	8, 153	90. 4	3, 220	109. 9	403	151. 8	1, 371	221. 0
Adjusted total <sup>1</sup> .....		93. 3		103. 7		178. 0		218. 3
10-19.....	460	24. 2	86	30. 4	65	65. 3	41	75. 3
20-29.....	1, 475	79. 0	490	88. 7	165	220. 4	241	206. 0
30-39.....	1, 538	91. 9	652	99. 2	61	195. 3	323	214. 2
40-49.....	1, 469	114. 0	732	124. 4	41	186. 3	274	204. 9
50-59.....	1, 058	103. 5	510	116. 2	28	130. 7	198	212. 8
60-69.....	921	124. 0	363	141. 0	25	242. 6	175	352. 1
70 and over.....	1, 232	232. 7	387	255. 3	18	292. 0	119	553. 2

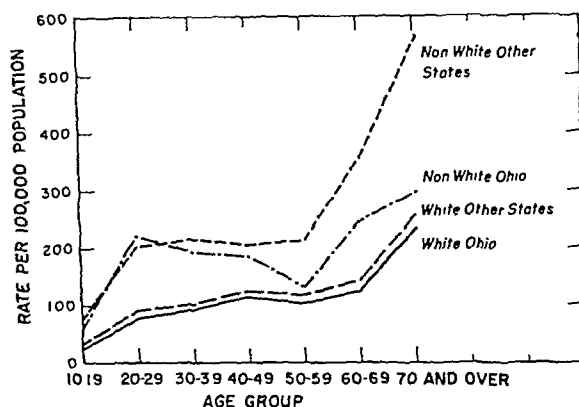
  

Age (in years)	Native-born females							
	White				Nonwhite			
	Ohio		Other States		Ohio		Other States	
	Number	Rate	Number	Rate	Number	Rate	Number	Rate
Crude total.....	6, 702	69. 8	2, 645	83. 8	297	105. 0	1, 023	158. 0
Adjusted total <sup>1</sup> .....		70. 5		78. 2		124. 0		155. 8
10-19.....	305	16. 1	56	18. 7	56	53. 5	37	58. 5
20-29.....	1, 242	62. 8	420	63. 8	104	126. 4	199	142. 5
30-39.....	1, 478	84. 0	619	87. 7	53	144. 1	249	156. 6
40-49.....	1, 091	80. 7	543	90. 6	33	142. 3	203	154. 7
50-59.....	866	77. 8	375	87. 4	15	92. 7	158	186. 4
60-69.....	746	88. 3	264	96. 3	15	125. 3	91	196. 6
70 and over.....	974	147. 3	368	195. 6	21	272. 1	86	370. 4

<sup>1</sup> Age-adjusted rates based on total native-born Ohio population.

NOTE: The numbers of admissions are for the entire 4½-year period; the rates are on an average annual basis.

Figure 3. Average annual first admission rates to Ohio public mental hospitals for native-born males, by age, color, and place of birth, all diagnoses, 1948 to June 30, 1952



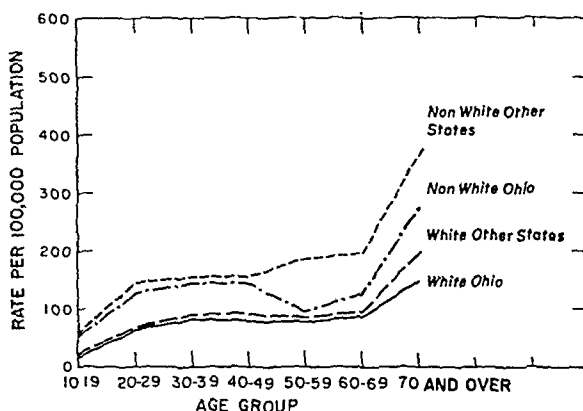
immigrants" (5). The Ohio data substantially agree with the findings of Ødegaard and Malzberg.

However, had the rates of first admission for foreign-born and native-born been alike after age adjustment, it would not have been an indication that there are no true differences in their respective incidence of mental illness. It had been mentioned earlier that there were forces, such as lack of family and language, and economic and other problems of assimilation, that might have tended to increase the rate of hospitalization among the foreign-born.

It is also conceivable that cultural differences might have tended to keep some of the foreign-born out of hospitals unless very ill. Also, screening of immigrants and deportation of others may have been more diligently carried out since the 1930's. The proof of not becoming public charges may have raised their level of socioeconomic and educational status somewhat.

Nevertheless, given the current volume of immigration, the factor foreign-born per se does not seem to warrant much attention. What should command considerable concern is the factor of migration. White and nonwhite males and females born in Ohio had lower rates than their counterparts who were born elsewhere in the United States and subsequently migrated to Ohio (table 2 and figs. 3 and 4). Malzberg and Lee in analyzing the New York State data also found that the rates for native

Figure 4. Average annual first admission rates to Ohio public mental hospitals for native-born females, by age, color, and place of birth, all diagnoses, 1948 to June 30, 1952



migrants, regardless of color or sex, are strikingly higher than those for persons born in the State (5). Despite the agreement of these two studies, replication for other areas as well as other periods of time is needed. Furthermore, as Dorothy S. Thomas stated in her introduction to "Migration and Mental Disease," such studies must be extended to include analyses of differentials between migrants and nonmigrants in areas of origin as well as in areas of destination (5).

Advantage should be taken of the 1960 census. Information regarding migrants (native-born and foreign-born) by such factors as household composition, marital status, education, and occupation could be obtained for mental patients and correlated with information obtained at the time of the 1960 census. In addition, the psychiatric diagnosis of the patients should be considered in the analysis. Such studies require large numbers of patients. It might be that several States would have to collect, in a comparable fashion, data which could be pooled and analyzed to provide this needed information about mental illness among migrants, both native- and foreign-born.

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higher than those for the native-born. Age, the same factor to which attention was called in the 1880 census, appears to account for part of the disparity in these crude rates. In Ohio, for example, the median age of the foreign-born and native-born whites, was, respectively, 42 and 19 in 1880, 39 and 21 in 1910, and 57 and 30 in 1950. Nevertheless, when the 1950 rates were adjusted for age, the rates remained higher for the foreign-born, as would be expected since figures 1 and 2 and table 1 show

that for most age groups the rates were either at the same level or higher for the foreign-born.

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<sup>1</sup> Age-adjusted rates based on total native-born Ohio population.

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# Meteorological Aspects of Large Scale Air Pollution

LESTER MACHTA, Sc.D.

THE practicing weather forecaster cares very little about the composition of the air aside from its water vapor content. But we are beginning to realize that there is more to meteorology than advising the public whether or not it will rain tomorrow. We live in the atmosphere and it is important that we keep it as clean as possible. Man's dispersal of wastes into the air has become so enormous that in certain areas, particularly urban ones like Los Angeles, the atmosphere is at times incapable of providing adequate local dilution.

Though pollution by cities of their own immediate locality is a major concern, we should keep in mind that most pollutants are not destroyed by disposing of them downwind of a city. Under some circumstances, the pollutants of many cities combine and affect areas far removed from the sources of pollution. Ultimately, if the exponential growth of industry with its waste disposal problems continues, contamination may become global, making further dilution impossible. When pollution becomes a worldwide problem, the allowable releases will depend on the atmosphere's cleansing ability.

The consequences of air pollution reach beyond immediate effects such as damage to health

and agriculture. They affect the weather as well. There is strong evidence that increased atmospheric contamination reduces visibility and modifies electrical conductivity, precipitation, and the radiation balance. What subtle and far-reaching effects will result from these and other phenomena are now unknown.

Our present aims in studying the meteorology of air pollution are measurement, understanding, and prediction. Unfortunately, none of these reduces the amount of pollutant put into the atmosphere. But through the proper selection of industrial sites, local contamination can be minimized; through meteorological detective work, an offending culprit can be uncovered; and through forecasting, pollutants can, in principle, be withheld pending a return to conditions more conducive to dilution.

The major effort in meteorological research of air pollution is on a microscale—citywide contamination. At present, a meteorological analysis is considered successful if a way is found for the pollutants to be vented into the atmosphere without local difficulties. By the time the effluent reaches the next city, diffusion is expected to reduce concentrations to a satisfactory level. But there are exceptions even today. For example, Dr. C. D. Keeling of the Scripps Institution of Oceanography at La Jolla, Calif., almost 100 miles south of Los Angeles, says that he has often watched the carbon dioxide concentration rise from 310 to 340 ppm as a brown cloud from the north descends on his observation post. Similarly, it has been estimated that 15 percent of the organic partic-

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*Dr. Machta is chief of the Special Projects Section, Office of Meteorological Research, U.S. Weather Bureau. This article is based on a paper given at a symposium on the physics, chemistry, and biology of the atmosphere, published in the proceedings of the National Academy of Sciences, December 1959.*

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## Community Cancer Demonstration Project Grants

For the current fiscal year, Congress has appropriated \$1,500,000 for community cancer demonstration project grants. The Cancer Control Branch, within the Division of Special Health Services, Public Health Service, is administering the fund and is receiving applications from health agencies and nonprofit organizations and institutions. Additional projects may be approved during spring and summer of 1960.

Among types of projects believed to offer the best opportunities for demonstrating better ways of providing community cancer control services are:

- Professional and technical education in cytology.
- Screening female beneficiaries of medical care for cancer of the cervix.
- Selected educational projects, particularly public information and followup services, to emphasize the importance of periodic uterine cytology examinations.
- Professional educational activities emphasizing the importance of including cancer diagnostic aids in complete health examinations.
- Selected public educational projects on the desirability of and need for health maintenance examinations.
- Evaluation of effectiveness of public educational activities.
- Tumor registers collecting data of exceptional value.
- Extension and evaluation of rehabilitation programs (in cooperation with State rehabilitation agencies).

- Selected projects demonstrating effective treatment for cancer in public beneficiaries of medical care.

The types of projects suggested are not meant to exhaust all possibilities. Other worthwhile locally sponsored and locally directed demonstration projects will be considered on their own merits.

Applications are accepted from nonprofit organizations and institutions and official health agencies. The appropriate State health officer and Public Health Service regional medical director first review and process applications. The requests are then submitted to the advisory committee and the advisory council for recommendation of approval or disapproval. Formal action on applications and recommendations is taken by the chief of the Bureau of State Services, Public Health Service, to whom authority has been delegated by the Surgeon General.

Projects may be approved initially for as long as 3 years. When activities proceed satisfactorily and funds are available, assistance continues through the approved period. In special instances, assistance may include the assignment of personnel and the provision of equipment and supplies. Additional information and application forms may be obtained from the eight regional offices of the Public Health Service.

The Cancer Control Branch and its Advisory Committee believe that much can be done to reduce illness and death from cancer now, especially from cervical cancer.

ulates measured at Louisville, Ky., originate outside the area of Greater Louisville.

The areawide air pollution problem will be with us in the near future, if it is not here today. Meteorological study of this larger problem has so far succeeded in identifying the weather conditions conducive to large-scale air pollution episodes and confirming the relation between these conditions and high concentrations of pollutants.

### The Warm High

We think there are three weather factors which favor air pollution episodes on a broad scale: first, small dilution due to light winds and a low altitude thermal inversion which inhibits upward mixing; second, the absence of rain scavenging; and third, the persistence of this weather for several days, permitting pollutants to accumulate.

This weather fits the description of a warm high-pressure system. It is entitled a "warm" high because, unlike a polar mound of high pressure, the air within it is warm in comparison to the surrounding atmosphere. Insofar as I am aware, every important air pollution episode, Donora, London, and Meuse Valley has occurred during the passage of a warm high-pressure system. In Los Angeles, episodes coincide with this weather system, but other meteorological and topographical factors are also important. Orographic features and sources of pollutants determine where and when an episode will occur during the presence of a warm high-pressure system.

We can illustrate the significant factors with surface weather maps which are typical of a slow-moving warm high. Figure 1 shows the surface weather charts during 4 successive days of the well-known episode at Donora, Pa., in October 1948. The thin lines are isobars. The heavy lines mark the separation between warm and cool air masses. Shaded areas show regions of rain. A center of high pressure on the first day of the series is in southern Ohio. On successive days it moves erratically over the eastern United States, a typical situation.

The speed of wind at ground level and in the first few thousand feet of air is more or less inversely proportional to the spacing of the

isobars. From these maps it is evident, first, that the weak pressure gradient associated with the wide spacing of the isobars in the region around the center of high pressure results in very light winds. Local ventilation is severely restricted by this condition. Second, the air mass making up the high pressure is sinking. The result is a low-level thermal inversion, with a base at about 3,000 feet in the afternoon and lower at other times. This inversion acts like a lid, preventing upward mixing. Because of clear skies the nocturnal outgoing radiation is intense, building up a very strong nighttime ground thermal inversion which likewise inhibits vertical mixing. In the London and Donora episodes, the air cooled enough to produce fogs which could not be burned off by the daytime solar heating.

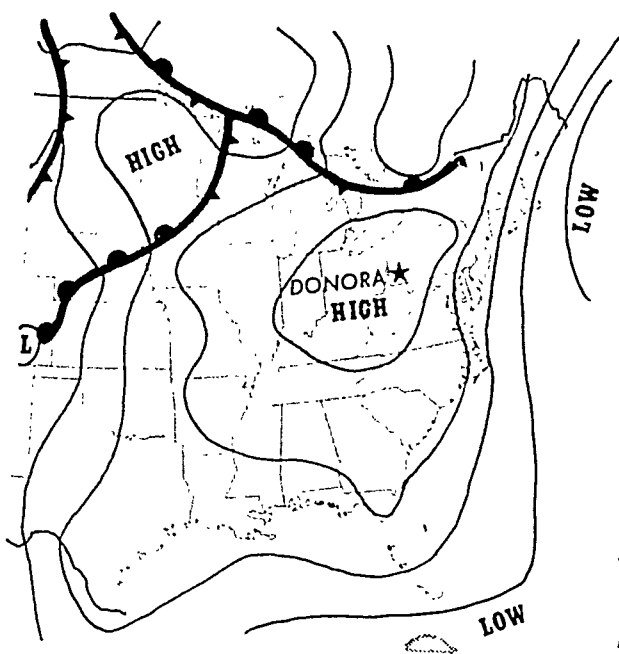
When a large area of the United States is dominated by such a slowly moving high-pressure system, the normal, fairly rapid west-to-east airflow is replaced by air which drifts about slowly and irregularly. Pollutants from one city are more likely to be added to those of another in appreciable concentrations. The absence of vertical mixing confines all of the contamination to the layer of air near the ground.

In a study of potential atmospheric contamination from nuclear reactors, Pack and Hosler (1) have analyzed the effects of a stagnant meteorological pattern upon atmospheric dilution over the densely populated and industrialized Middle Atlantic States. To do so, they determined the spread of effluents if they were released continuously for a 36-hour period from eight hypothetical locations during an actual stagnant weather system.

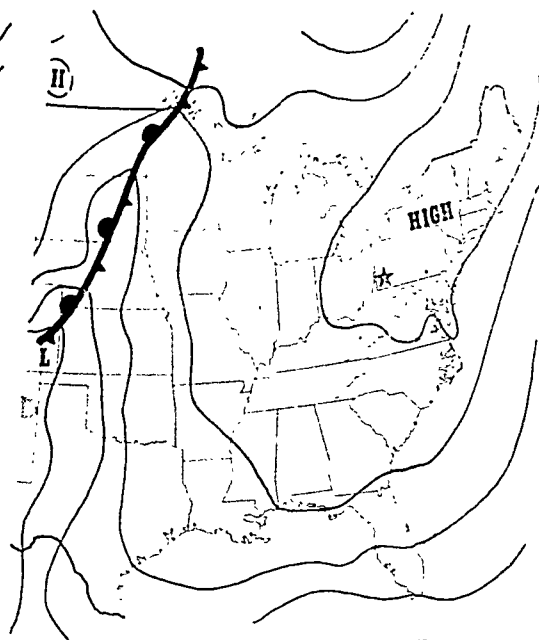
They selected a slowly moving weather system that occurred October 11-16, 1956. During all 5 days of this weather pattern, a warm high-pressure system was quasi-stationary over the Middle Atlantic States. The system was attended by light winds at the surface and the first few thousand feet above the ground. An intensifying subsidence inversion, based at about 3,000 feet, accompanied the high-pressure cell, while ground thermal inversions prevailed during nocturnal hours.

Pack and Hosler's analysis, illustrated in figure 2, is based on the following assumptions:

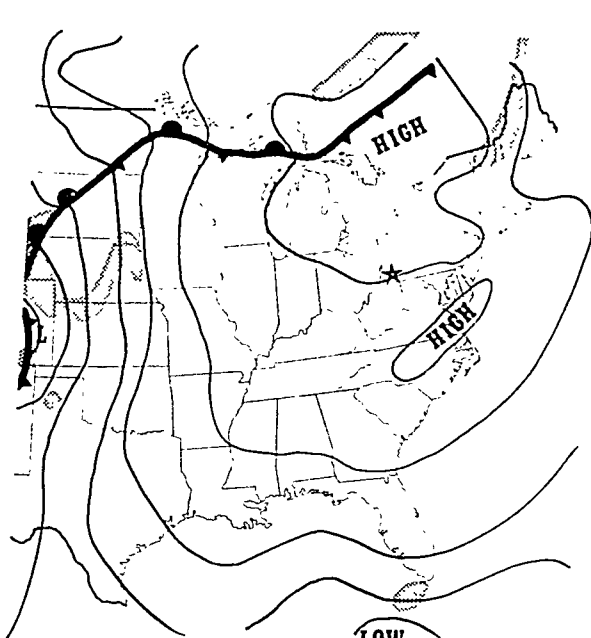
Figure 1. Surface weather charts for October 27-30, 1948, during the air pollution episode at Donora, Pa.



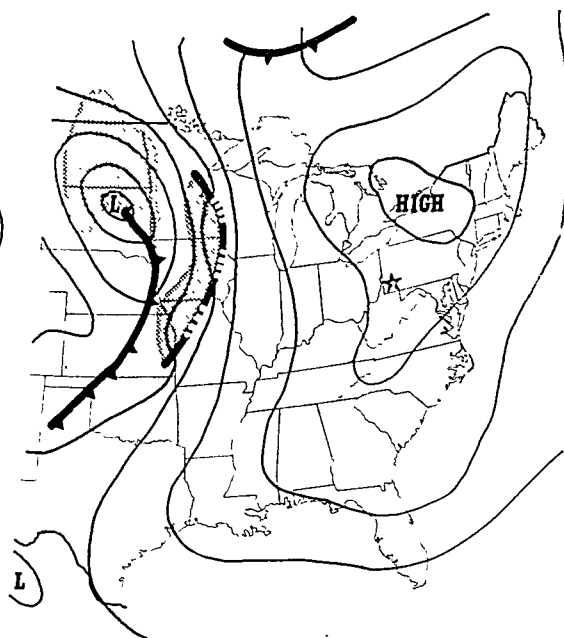
October 27, 1948



October 28, 1948



October 29, 1948



October 30, 1948

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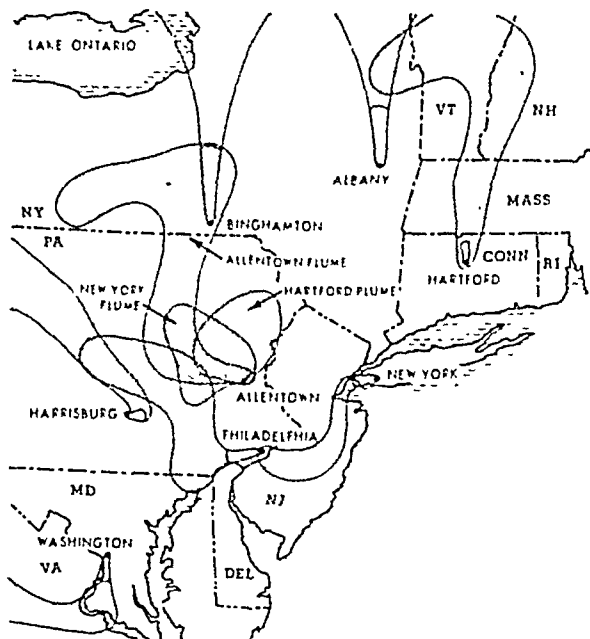
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**Figure 2. Plumes of effluents which would be created by 36 hours' continuous release from 8 locations under the weather conditions of October 12-13, 1956**



(a) effluent is carried at the speed and direction of the surface wind; (b) the plume diffuses  $11^\circ$  laterally in each 6 hours of movement; (c) vertical spreading of the plume is limited to within the mixing layer, that is, the estimated depth of the well-stirred lower atmosphere at the time of maximum afternoon temperature; and (d) effluent is uniformly distributed within the volume defined by the first three assumptions, except for the material dispersed during the most recent 6-hour period, which maintains a separate and distinct geometry of distribution.

In figure 2, the shading for the most recent 6-hour plume traverse is more intense to distinguish it from the older, more dilute cloud of effluent. The irregular paths are apparent; more important, this diagram illustrates the reinforcement of several plumes from many sources as a result of time and space variations. For instance, effluents from New York, Hartford, Philadelphia, and Allentown all contribute to pollution of the area just west of Allentown, Pa.

It is possible to compute average concentrations of pollutants for this model, since the volume of air in the plumes can be readily es-

timated. By Pack and Hosler's calculations,  $5 \times 10^{12}$  cubic meters is the minimum volume of air into which the effluent in a single plume would be released in a 36-hour period. If 10,000 tons of carbon monoxide—the amount released in Los Angeles in 2 days—were diffused in a 48-hour plume, an average concentration of 1 ppm would blanket the area over which the plume extended.

Finally, the hypothetical situation depicted by Pack and Hosler accounts for the movement and overlapping of effluents from only eight locations in the Middle Atlantic States. It underestimates the actual cases of overlap, since there are many additional sources of pollution in this heavily industrialized area.

### Forecasting Episodes

In 1957, an experimental program was established to associate predictions of stagnant warm high-pressure systems with measurements of pollutant concentrations. One objective of the program is to make sure that the stagnant warm high-pressure system is the one to which meteorologists should direct their attention.

Techniques developed under the program were applied to the eastern United States in a study covering the period September 1 through November 15, 1958. The weather criteria which had to be met in order to predict a potential for above-normal accumulation of pollutant were:

1. Surface winds of less than 8 knots.
2. Windspeeds no greater than 25 knots at any level below 20,000 feet.
3. Evidence of sinking motion at levels below 15,000 feet.
4. Continuation of the preceding three conditions for at least 36 hours.

Air quality data were collected from the study area by stations of the National Air Sampling Network. Niemeyer (2) showed from examination of the data that, with few exceptions, highest dust loadings occurred during the five periods when warm high-pressure systems were predicted to, and subsequently did, overlay the area. This experiment demonstrated that it is feasible to use forecasts of large-scale weather features to delineate periods of high air pollution potential over large areas.

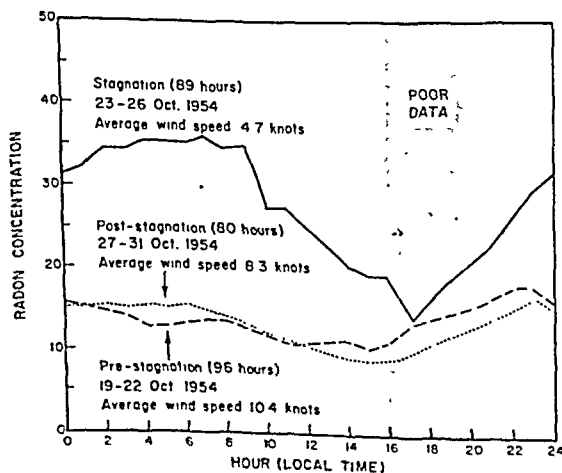
## Radon

Radon is a naturally occurring radioactive gas which is emitted from the ground. It has been amply demonstrated that ground-level radon concentration increases remarkably when atmospheric vertical mixing becomes weak. For example, nighttime ground-level concentrations are higher than daytime concentrations.

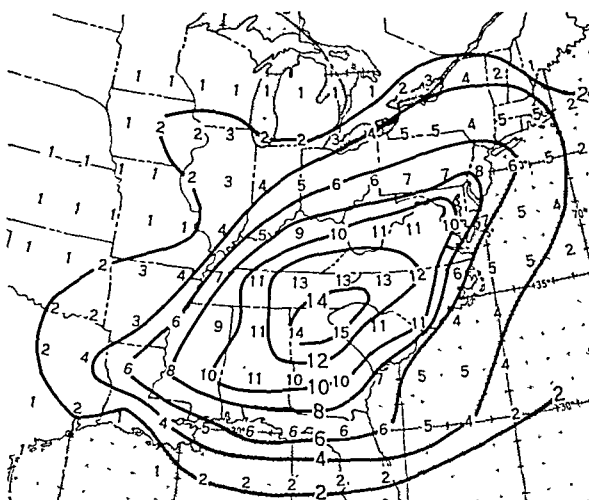
We have also studied radon concentration during the passage of a slow-moving warm high-pressure system. The system we selected occurred in Washington, D.C., in late October 1954. Through the courtesy of Dr. Luther Lockhart of the Naval Research Laboratory, the measurements of radon concentration in Washington recorded for that time were made available to us.

Figure 3 shows the average diurnal cycles of radon concentration in Washington before, during, and after passage of the warm high, or stagnation period, of late October 1954. Average windspeed during the 89 hours of stagnation was only 4.7 knots. It is apparent from the figure that significantly higher radon concentration occurred while the warm, stagnant high lay over Washington than either before or after its passage. The shaded area identified by "poor data" corresponds to the period of the daily filter changes when the radon decay products were not yet in equilibrium.

**Figure 3. Average diurnal cycles of radon concentration in Washington, D.C., before, during, and after passage of a stagnant warm high-pressure system, October 1954**



**Figure 4. Occurrences of stagnant warm high-pressure systems during the month of October, 1936-1956**



Further study of radon observations may reveal other applications for this type of data to air pollution problems.

## Geographic Frequency Distribution

Korshover (3) has studied the spatial and temporal frequency distribution of stagnant warm high-pressure systems for the United States east of the Rockies. The maximum frequency occurs in the southern Appalachian Mountains and decreases radially from this area. Analysis of cases by months reveals a pronounced maximum frequency in the month of October.

Geographic distribution of the frequency of October stagnant warm highs is shown in figure 4. The numbers on the figure denote the frequency during a 21-year period of cases with 4 or more successive days of light winds (under 8 miles an hour). The heavy lines indicate equal frequency of occurrence. This October weather coincides with pleasurable memories of Indian summer, a period of unusually fine weather after the heat of real summer has waned.

It may be surprising to note the high frequency of cases, even in winter, when warm high-pressure systems cover the southeastern United States. Some of these instances result from extension of the Bermuda high-pressure

cell onshore, much farther west than its normal position. It seems probable that with equal industrialization, air pollution complaints would be more numerous in the Southeast than, say, in New England with its stormier weather.

## Conclusion

I have described some meteorological aspects of large-scale air pollution, a problem almost certain to become aggravated in the future. The best way of avoiding air pollution episodes is by preventing dispersion of wastes into the atmosphere. Failing that, there are two ways the meteorologist can assist: first, along with health officials, he can monitor the atmosphere's cleanliness. Second, he can continue his efforts to devise adequate methods for predicting the dilution, transport, and removal properties of the atmosphere in case meteorological control becomes necessary—that is, permitting the re-

lease of pollutants only at times when weather conditions favorable to dilution have been forecast.

I suspect that in many ways the meteorologist is ahead of others in working on problems in this broader scale of air pollution.

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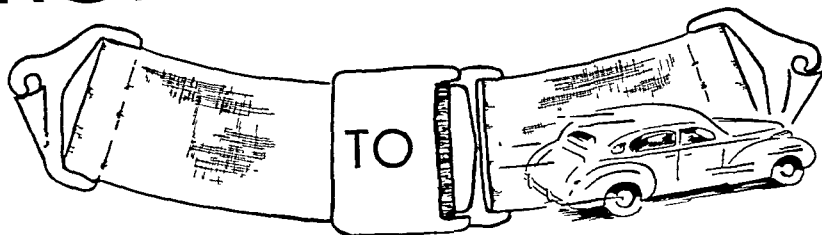
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# INTRODUCTION



## SEAT BELTS

ALVIN R. LEONARD, M.D., M.P.H., ALBERTA W. PARKER, M.D., and BARRY MILLER, M.D.

**T**HE HEALTH DEPARTMENT of Berkeley, Calif., has launched a pilot safety campaign based on information collected by the automotive crash injury research program at Cornell University which suggested that the use of seat belts in automobiles would reduce accident fatalities by at least 25 percent (1). The decision to launch the campaign was predicated largely upon the conclusion of John O. Moore, director of the Cornell project, who stated that "it is our opinion, based on the relatively massive evidence available, that seat belts are the most important single economically feasible device available to control trauma associated with automobile accidents throughout our Nation" (2).

Projected, the Cornell figures mean that 5,500

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lives could have been saved in the United States by the use of seat belts during 1957.

On the principle that safety education begins at home, a program to encourage seat belt use among staff members of the Berkeley City Health Department was instituted in November 1958 (3). Objectives of the program were:

1. To provide a demonstration to the community emphasizing that the health department considers use of seat belts to be an effective means of minimizing injury and preventing death from automobile accidents.
2. To prevent serious injury and death among health department staff members and their families.
3. To provide a pilot study which might be useful to other organizations in identifying the problems encountered in promoting such a program.

Since the staff of the Berkeley Health Department uses private cars for city business, the cost of purchase and installation of the seat belts had to be borne by the employees themselves. It was decided at the outset to seek a lower unit price through group purchase.

"Operation Seat Belt" was supported vig-

ously throughout the department. A series of monthly departmental staff meetings, attended by most employees, was devoted exclusively to installation and use of seat belts. Benefits of seat belts were presented by showing the motion picture "Impact," which was discussed by an officer of the State highway patrol. The Cornell studies were summarized by the field representative assigned to the automotive crash injury research project in the California State Department of Public Health. Employees were given detailed information concerning the value of seat belts in reducing serious injury and death. Each meeting allowed a period for questions and discussions.

To insure participation throughout the department, a seat belt committee of representatives from each group was formed. It sought by questionnaire to ascertain how many employees already had seat belts and how many would like to share in the group purchase.

Of 53 employees owning automobiles, 5 already had at least 1 seat belt installed. Forty-four had no seat belts, but were interested in acquiring them. Four had none and were not interested. There were six employees who did not own automobiles.

Reasons given for disinterest were "I can't afford them" or "I do city driving primarily and my understanding is that seat belts are useful only on the highway." The view that seat belts are of no value in the city appeared to persist despite explanations that many fatalities occur through accidents in town, which could be prevented by their use.

The California Highway Patrol tests seat belts and lists those which meet acceptable standards (4). This list was used in selecting the seat belt to be purchased. A choice of two brands was offered. Group purchase reduced the cost to the individual by approximately one-half of the retail price. (An additional saving on insurance is potentially possible, since some insurance companies grant reduced premiums in covering medical expenses and disability for car owners who use seat belts.)

Installations were handled by individual garages; this was not included in the group purchase price of the seat belts. Variations of make and model of car tend to command price differences for installation. All installations

## National Seat Belt Campaign

During the last year the Public Health Service joined forces with the National Safety Council and the American Medical Association in a campaign to educate the American public as to the value of automobile safety belts and to encourage the widespread use of this device.

Research has established that at least 5,000 lives could be saved annually if occupants were not thrown from motor vehicles when accidents occur, and the severity of injuries experienced in motor vehicle accidents is lessened when occupants are restrained by safety belts.

Each of the three national organizations cooperating in this campaign is making every effort to use its own machinery and resources to the utmost in attaining the goal of universal acceptance of safety belts as a "standard" feature of the American automobile.

The Accident Prevention Branch of the Public Health Service has worked with State and local health departments in implementing this project, and has aided in the development of many local campaigns. All public health workers may be proud of the enthusiasm and energy displayed by communities such as Berkeley, Calif., in encouraging the use of seat belts.—DR. PAUL V. JOLIET, *chief, Accident Prevention Branch, Public Health Service.*

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followed instructions of the manufacturers, and the belts were secured to the frame if possible.

Additional resistance to the installation of seat belts, which had not emerged in the preliminary survey of interest, was expressed by several staff members at the time of actual purchase. First mentioned was the cost. Then, some of the women staff members were concerned lest the belts possibly wrinkle their clothing. Other staff members stated that their work in the field necessitated many stops and starts and the repeated fastening and unfastening of seat belts would be a nuisance and a waste of time.

Fear of death resulting from being trapped inside an automobile in an accident involving fire or water caused some anxiety and uncertainty also. In this connection, it is noted that

some newspaper reports of accidents in which wearers of seat belts were drowned or burned were misinterpreted to mean that the seat belts had been the cause of the accidents. Even though various facts and figures were cited to show that in the vast majority of motor vehicle accidents water and fire are not important factors, it was difficult to allay some of these apprehensions.

During the months following, other objections to seat belts came to the attention of the health department's committee from sources outside the department. Some of these were: "Good drivers don't need seat belts." "Drivers using seat belts have a false sense of security and become overconfident." "Seat belts have a negative psychological effect on safe driving." Objections such as these may arise within any group undertaking a seat belt program. Approximate answers to these and other objections are offered in the literature available (5). In most instances where resistance was encountered or fear expressed, a well-informed committee member discussed the issue with the individual concerned. This personal approach worked well.

"Operation Seat Belt" was a completely voluntary program. No administrative pressure was applied. Installation of the seat belts was accomplished efficiently with little if any loss of staff time.

As a direct result, 106 seat belts were purchased by 38 employees. Two other employees who had not had seat belts at the time of the preliminary survey purchased them independently. Including the 5 employees who already had seat belts, 45 of the 53 employees who own automobiles, or 85 percent of the potential, now have seat belts in their cars. Among the eight who do not, several have indicated that they may acquire them.

Following these events in the health department, a similar program was conducted by employees of the public school system. An initial goal of this program was the sale of 100 seat belts to teachers. However, this was far exceeded in a short time: more than 450 seat belts were purchased by teachers. Students in the adult driver training program purchased an additional 206.

The Berkeley police department, which also makes use of personally owned cars for city business, is encouraging officers to equip their cars with seat belts. Currently, about 50 percent of the members of the department have seat belts in their automobiles.

The health department is strongly recommending to the city government that it have seat belts installed as standard equipment on all city owned vehicles in order to achieve reduction in death, injury, disability, man-days lost from work, and possibly, a saving in insurance premiums.

The example of these official agencies has had its expected influence in the community (6). For example, a large retail consumers' cooperative is now conducting a campaign for the sale and installation of seat belts among its members.

### Discussion

The current epidemic of traffic accidents should be viewed within the concept of preventive medicine. Man's perception of preventive medicine is dependent on the period of time and the geographic location in which he lives. It is also dependent upon his culture or subculture, since different cultures exhibit wide variations in their concepts of ability to control the obvious threats to health and life.

In the development of preventive measures, there are essentially three stages: the stage when there is no scientific knowledge available, the stage when there is scientific knowledge available but it is not being applied by a significant number of the population, and the stage when there is scientific knowledge which is being effectively applied.

Until recent years we were in the first stage in respect to poliomyelitis. Today we are still in this first stage of not having the scientific means of preventing deaths from such diseases as cancer of the pancreas, most cases of leukemia, multiple sclerosis, and many others. Historically, our forebears were in this helpless situation with high maternal and infant mortality rates and high death rates from the various plagues.

The primitive reaction to such situations is either the adoption of a completely fatalistic

attitude, with the hope that the threat will not strike, or the use of various mechanisms prevalent in the culture, such as magic incantations, the use of symbolic objects, or other equally noneffective rituals to ward off the danger. Such attitudes and actions, although of dubious value, are not inappropriate to the first stage when there is really no effective measure for dealing with the hazard.

Such behavior, however, is entirely inappropriate when a society is in the second stage, when there is knowledge which is not being effectively applied. This is the situation in which we find ourselves today in regard to automobile accidents. We are both the perpetrators and the victims of a cultural lag. A scientifically proved preventive measure is not being applied, with a resultant needless loss of thousands of lives, and the needless occurrence of tens of thousands of disabilities. The psychological attitude of fatalism and the acceptance of a feeling of helplessness in automobile accidents contributes to the death toll and reinforces the attitude of fatalism, creating a vicious cycle. This cycle must be broken.

If there were 5,500 needless deaths annually from poliomyelitis, public health workers would take action immediately. If not, the American public would fast lose confidence in public health, and rightly so. When motor vehicle accidents are reviewed, however, it becomes quite apparent that not only the average person driving his car along the Nation's highways and freeways, but we who are specialists in the prevention of disability and disease seem to share the fatalistic approach to this common hazard to health and life. By our inaction, we have shown surprising apathy and lethargy in setting an example of effective leadership in preventive medicine. An inescapable responsibility of public health is to provide leadership in the community in moving from stage two to stage three.

## Summary

Experience in Berkeley indicates that a local health agency is in an excellent position to set the pace for the community leaders in encouraging the use of automobile seat belts as a protection to automobile passengers and drivers. The use of seat belts is only one aspect of an extremely complex safety process. Safety is a total community responsibility, including the responsibility of the automobile designer, manufacturer, and vendor. Highway injuries and sequelae affect all segments of society. In a drive to achieve primary as well as secondary prevention, a health service works with other agencies such as police and fire departments, safety councils, county medical societies, community hospitals and emergency facilities, the schools and their driver training courses, and trade or manufacturing associations. Their combined efforts are needed to exert effective influence toward safe driving and toward the use of devices which will minimize and reduce death and disability on the streets and roads.

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# A Fatal Case of Rabies in a Woman Bitten by an Insectivorous Bat

GEORGE L. HUMPHREY, D.V.M., M.P.H., GRAHAM E. KEMP, D.V.M., M.P.H., and  
E. GLENN WOOD, M.D.

RECOGNITION since 1953 of widespread rabies infection in insectivorous bats, native to the Western Hemisphere north of Mexico, has raised considerable conjecture regarding the potential of transmission to man and other animals and the role such a reservoir may play in the ecology and epidemiology of rabies (1-4). While the ecology of rabies in insectivorous bats is largely unknown, it is established that the virus may be present in the salivary glands and saliva (2, 4-10) and that some infected specimens may apparently harbor the virus as symptomless carriers (1, 2, 8, 11, 12). Whether this situation existed previously and is only now being recognized or is of recent origin is not known. Johnson (13) is of the opinion that rabies in bats is of recent origin. Since 1953, there have been numerous reports in the United States of persons being bitten by bats. Some of the animals have been rabid, some not rabid, and others were not secured for rabies examination.

Although epidemiological evidence has slowly accumulated incriminating insectivorous bats as a source of rabies infection for man (14-16) and while transmission from a naturally infected insectivorous bat to laboratory mice has been demonstrated (6), there has been no unequivocal evidence that rabid insectivorous bats have in-

fecting man or other animals in nature with the exception of the case to be described here.

A fatal case of rabies in a California woman definitely incriminates the silver-haired bat, *Lasionycteris noctivagans*, a free-living, insectivorous species, as a source of the disease for man.

## History of Exposure

On Saturday, August 30, 1958, a 53-year-old woman picked up a bat that was lying on the ground near the porch of her home in Magalia, Butte County, Calif. In attempting to place it in a tree where her two dogs would not further molest it, she was bitten on the middle finger of the left hand.

The bat apparently appeared abnormal, for she telephoned a veterinarian, Dr. W. H. Martin of Paradise, Calif., about treating the bat for a broken wing. Dr. Martin, upon hearing she had been bitten, suggested the bat might be rabid and advised the woman to refrigerate the animal and notify the Butte County Health Department. Because of the Labor Day weekend the health department was not notified until Tuesday, September 2.

The county health department laboratory examined the bat's brain and reported it positive for Negri bodies. A portion of the brain and the carcass of the bat were forwarded to the California State Department of Public Health. Identification of the bat and additional laboratory findings will be described later.

On the basis of the county laboratory's posi-

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tive findings, the woman was administered 3,000 units of hyperimmune antirabies serum intramuscularly late on September 2, the third day after she was bitten. The following day Dr. Wood began a course of rabies vaccine. The vaccine, of duck embryo origin (17-19), was administered in 14 daily injections.

At the time this treatment was initiated, the bite wounds consisted of two small healing punctures in the region of the second interphalangeal joint of the middle finger of the left hand. Local treatment was not administered because of the time interval between the bite and the healing of the wounds.

Eight days after administration of the antiserum and 7 days after the start of the vaccine therapy, the patient developed a skin rash with severe pruritis. Daily administration of the antihistaminic drug pyrilamine maleate was begun, and the next day strontium bromide with calcium gluconate was added to the therapy. However the rash persisted until shortly after the series of 14 doses of rabies vaccine was completed. At no time were members of the corticosteroid group of drugs administered.

The woman apparently remained well until October 24, 1958, when she went to a local chiropractor complaining of numbness in the inner left arm, extending to the first two fingers, and of pain in the region of the third thoracic vertebra. She returned with the same complaints the next day. On October 26, the pain descended to the fifth or sixth thoracic vertebra, and she complained also of gas and pressure below the diaphragm. From October 27 through 29, her chief complaint was abdominal pain. The chiropractor, as far as is known, was unaware of the bat incident.

The chiropractor became increasingly concerned about the possibility of an intestinal obstruction and repeatedly urged her to enter a hospital. On October 29 she visited Dr. Wood with the complaint of acute abdominal distress. She was treated symptomatically and told to return if she was no better in the morning. Since there was no improvement in her condition, she was admitted to a local hospital at 9:40 a.m., October 30. The diagnosis on admission was possible intestinal obstruction and notations of pain in upper left abdomen, intermittent for 10 days. On November 4 the woman

died, 66 days following exposure, 49 days after antirabies treatment had been completed, and 11 days after onset of symptoms. (See clinical history during hospitalization, p. 320.)

### Laboratory Findings

An autopsy was performed approximately 13 hours after death. The only gross pathological finding was a 12-inch section of ileum, black in color and definitely delineated.

Bat and human brain material were submitted for further investigation to the virus and rickettsial disease laboratory, California State Department of Public Health, by the county health department. Findings are reported in full elsewhere (20) and are summarized here.

Microscopic examination of tissue impressions of the human brain material, stained by Sellers method (21), by the county health department and the State Department of Public Health, and examination of tissue sections by the State agency all revealed the presence of intracytoplasmic inclusion bodies not characteristic of Negri bodies. The histopathological picture was a diffuse nonsuppurative encephalomyelitis with the midbrain and brain stem especially affected.

Suspensions of the bat brain and the human brain material both proved infective for mice, and mouse brains all contained Negri bodies. The agent recovered from the human brain was further confirmed as rabies by serum neutralization test, using hyperimmune antiserum of equine origin.

### Other Possible Exposures

The husband of the deceased woman told Dr. Kemp that he knew of no exposures experienced by his wife other than the bat incident. The two dogs that may have encountered the bat and two cats on the premises at the time of the incident were still in good health on March 3, 1959.

The husband recalled that he had observed fecal droppings on a porch of the house on most mornings during the summer prior to his wife's exposure. From his description, these appear to have been bat droppings, and the porch probably served as a night roosting site, perhaps for the moribund bat that his wife found. No



Photograph by Ernest P. Waller, National Zoological Park, Smithsonian Institution  
**Silver-haired bat (*Lasionycteris noctivagans*)**

droppings were observed after the date of the biting incident.

During the winter, the husband stored boards in piles on the superstructure of his small sawmill, which is adjacent to the house. Early each spring when he moved the boards to spread them out over the superstructure of the mill for shade, he said that he frequently uncovered bats between the boards.

#### **The Silver-Haired Bat**

The carcass of the bat which had bitten the woman was identified as a silver-haired bat, *L. noctivagans*, by Keith F. Murray, mammalogist, bureau of vector control, California State Department of Public Health, and confirmed by Seth Benson, Ph.D., Museum of Vertebrate Zoology, University of California, Berkeley.

*L. noctivagans* (see photo), the only species in its genus, is distributed widely over the northern part of North America. It inhabits for-

ested areas and characteristically roosts under loose slabs of bark on trees. The species is infrequently encountered, although it is probably fairly common in suitable areas. Colonies have been found in the eastern part of the United States, but, in general, it is a solitary or free-living bat.

It is generally accepted to be a migratory species. In California, although there is no clear evidence of migration, scattered records suggest movement to lower elevations in winter. The observed distribution in California is primarily in the northern forest areas, the Sierra Nevada range, and along the coast south to Monterey County.

Butte County in northern California is divided into the Sierra foothills, which support open growths of blue oak woodland, Ponderosa pine forest beginning at 2,000 feet, and Douglas fir forest, beginning at 3,000 feet. There is a Ponderosa pine forest in the immediate vicinity

of the house where the biting incident took place. About 1 mile distant is a large, fresh-water reservoir.

*L. noctivagans* has been found to be rabid in at least two other recent instances. One oc-

curred in Osoyoos, British Columbia, in August 1958. A bat found in an old shoe bit a 75-year-old man on the thumb and index finger of the left hand. Brain tissue and salivary glands of the animal, a mature female silver-haired bat,

## Clinical History During Hospitalization

*First hospital day.* Meperidine hydrochloride, an analgesic, phenothiazine chlorpromazine, a depressant, and secobarbital sodium, a sedative and hypnotic, were administered as required. Roentgenographic gastrointestinal studies revealed essentially negative findings. An electrocardiogram showed an abnormal picture which was interpreted as myocardial strain.

The results of blood studies follow:

Red blood	
count-----	4,650,000 (appears slightly hypochromic)
Hemoglobin-----	87 percent, 13.6 gm.
White blood	
count-----	16,300
Total polymorphonuclear leukocytes-----	91
Non-segmented-----	1
Segmented-----	90
Eosinophiles-----	0
Basophiles-----	0
Total lymphocytes-----	5
Monocytes-----	4
Mycocytes-----	0

Temperature ranged from 96.3° to 98.0° F., pulse from 75 to 80, and respirations from 12 to 20 per minute.

*Second hospital day.* The patient complained of pain in the abdomen, arms, and back and was extremely restless. Urinary incontinence was noted, and she was reported to have been immodest before visitors. She was again given meperidine hydrochloride and phenothiazine chlorpromazine. Neostigmine, a parasympathetic nerve supply stimulant, phenobarbital, belladonna, and atropine were also administered. A urinalysis revealed largely negative findings with the exception of large amounts of acetone.

The patient's temperature ranged from 98.2° to 98.6° F., her pulse from 88 to 102, and respirations from 15 to 24 per minute.

*Third hospital day.* The patient had a good appetite for breakfast but ate little in the latter part

of the day. She had poor muscular control of the extremities and complained of pain in many parts of her body. She was again given meperidine hydrochloride, phenothiazine chlorpromazine, belladonna, and, in addition, acetophenetidin-acetylsalicylic acid-caffeine.

*Fourth hospital day.* The patient complained of severe pain, especially in the abdomen and down the legs. She ate well, however. Late in the day she became restless and tossed and turned a great deal. She was given meperidine hydrochloride, phenothiazine chlorpromazine, belladonna, secobarbital sodium, and phenobarbital.

The results of a spinal fluid examination were: appearance—clear; white blood count—none; protein—120 mg. percent; sugar—77 mg. percent; and Pandy test—positive.

Temperature ranged from 98.6° to 99.6° F., pulse from 70 to 100, and respirations were 20 per minute.

*Fifth hospital day.* The patient was extremely restless, complaining of pain in her stomach and inability to eructate and pass flatulence. She stated she was unable to feel hypodermic injections, yet complained of wrinkles in the bedsheets. She had less control of her extremities than on previous days but ate an evening meal. She was again given meperidine hydrochloride, phenothiazine chlorpromazine, and belladonna. Her temperature rose continuously from 99.8° at 7 a.m. to 102.2° F. at 7 p.m. Her pulse ranged from 96 to 112 and respirations were 20 to 34 per minute.

*Sixth hospital day.* The patient complained of abdominal distress and inability to swallow the mucus which ran almost continuously from her mouth. She also complained of a feeling of heaviness in her chest. She deteriorated rapidly in the afternoon. Temperature, pulse, and respirations all rose briefly in the early afternoon to 102.4° F., 120, and 30 per minute, respectively, and dropped just prior to death, which occurred at 6:30 p.m.

were inoculated into four mice each at the animal pathology laboratory, Canada Department of Agriculture, in Vancouver. Between the 11th and 14th postinoculation day, all mice were dead. Microscopic examination revealed typical Negri bodies (5).

Another silver-haired bat, submitted from Pueblo, Colo., in 1959, was reported positive by the South West Rabies Investigation Station, Las Cruces, N. Mex. (22).

### Rabies in Nonsanguivorous Bats

Prior to 1953 rabies in bats was believed limited to the geographic areas inhabited by the vampire bat—Mexico, Central and South America, and Trinidad (23). Although a few isolations had been made from frugivorous and insectivorous species of bats in Brazil (24) and Trinidad (25), these were considered to be infections related to the vampire reservoir and were thought to play no role in the spread of the disease.

The first identification of rabies in a nonsanguivorous bat in the United States was made from a Florida yellow bat, *Dasypterus floridanus* (12,26). The bat was killed while unprovokedly biting a 7-year-old boy in daylight on June 24, 1953, in Florida. On September 23, 1953, a bat attacked a woman standing at a lake front in Boiling Springs, Pa. (27,28). The carcass was inadvertently destroyed but it is believed to have been a hoary bat, *Lasiurus cinereus*. In both instances the bats were confirmed as rabid by laboratory examination. Both persons received antirabic treatment and remained well.

Haupt and Rehaag (24) reported a leaf-nosed bat, *Phyllostoma superciliatum*, biting a calf which later developed paralytic rabies. Bell (6) achieved transmission of rabies by the bite of a naturally infected California myotis bat, *Myotis californicus*, on three of a litter of six mice.

Since the initial isolation of rabies virus from an insectivorous bat in Florida in 1953 (12,26), rabies has been identified in nearly 300 bats of 19 bat species, 4 solitary and 15 colonial, from 19 States in widely divergent areas of the United States (personal communication from E. S. Tierkel, Communicable Disease Center,

April 30, 1959). The greatest number of isolations has been made in the southwest.

### Bat-Associated Rabies in Humans

While the transmission of rabies infection from the vampire bat to man has been well authenticated (25), we are aware of only five reported instances of rabies in humans associated with insectivorous bats other than the case reported here. The first case, reported by Sulkin and Greeve (14), was in a 43-year-old woman who died of rabies in Texas in 1951. She stooped to look at a bat lying at the side of a road near her home. The bat flew up and bit her on the left forearm. Sixteen days later she became ill. She was admitted to a hospital 5 days later with a diagnosis of bulbar poliomyelitis. She died on the fourth day she was in the hospital. Negri bodies were observed on microscopic examination of brain tissue. The bat was neither identified nor examined for rabies.

The second case occurred in India (15). A railway worker, 48 years old, noticed some boys pelting a bat with stones. He was bitten viciously on the forearm when he attempted to place the bat in a tree. He went to a physician 3 months later complaining of malaise and difficulty in swallowing. He had a temperature of 100°F. His condition deteriorated rapidly and he died on May 24, 1954. The species of bat was not identified nor was it examined for rabies.

The third case, reported by Irons and co-workers (16), was in a Texas State Health Department entomologist who died of rabies on January 4, 1956. He had been engaged in research on bat rabies in Texas, capturing, handling, and banding insectivorous bats in caves from April through November 1955. Isolation of rabies virus had been made from bats taken from the caves where he had worked. He had also inoculated bats with rabies virus several months before his death. How and when he was infected even he did not know. He is known to have worked extensively, however, in Frio Cave, Uvalde County, a cave which figures prominently in the history of the fourth case. Rabies infection in the entomologist was confirmed by positive mouse inoculation test.

The cause of death in the fourth case has been

**Rabid bats found in California, January 1, 1954–December 31, 1959**

Year, month, and county	Species	Results of mouse inoculation test	Remarks
<b>1954</b>			
July, Sonoma-----	<i>Tadarida brazil- iensis.</i>	Combined brain and sal- ivary gland tissues positive.	Survey specimen, apparently healthy, collected near Forrestville.
<b>1955</b>			
June, Kern-----	<i>Myotis californicus</i> ---	Salivary gland tissue pos- itive, brain liquified, not examined.	Found dead in fish pond at Camp Yen- Hante on Green Horn Mountain.
September, Madera--	<i>Tadarida brazil- iensis.</i> <sup>1</sup>	Brain and salivary gland positive.	Bat observed in tree by man pruning tree in Madera. Man bitten captur- ing bat. Bat dead next morning. Brain Negri negative. Neutraliza- tion test positive.
<b>1956</b>			
August, Santa Clara--	<i>Myotis species</i> <sup>1</sup> -----	Brain tissue positive-----	Bat unprovokedly attacked boy and grandfather in patio of home in Los Gatos about 5:30 p.m. Boy bitten behind ear.
September, Shasta---	<i>Lasiurus cinereus</i> ----	Brain tissue positive-----	Apparently paralyzed bat observed on porch steps of home in East Redding. Dog possibly bitten. Negri positive.
September, Shasta---	<i>Tadarida brazil- iensis.</i>	Brain tissue positive-----	Partially paralyzed bat observed at noon crawling across floor of motor- cycle shop in Redding. Negri nega- tive.
October, Butte-----	<i>Lasiurus cinereus</i> ----	Brain tissue positive-----	Partially paralyzed bat found in yard of home in Chico. Negri negative.
<b>1957</b>			
July, Madera-----	<i>Tadarida brazil- iensis.</i> <sup>1</sup>	Brain tissue positive-----	Apparently partially paralyzed bat observed to fall out of tree on a ranch. Negri negative. Neutraliza- tion test positive.
September, Madera--	<i>Myotis evotis</i> -----	Brain tissue positive-----	Bat scared off ground during daytime in Agnew Meadows, High Sierras. Lit on nearby tree, then lit on second tree. Man bitten capturing bat. Negri negative.
<b>1958</b>			
April, Shasta-----	<i>Tadarida braziliensis</i> ---	(?)-----	Partially paralyzed bat found lying on porch of county health department below known bat roost in roof tiles. Negri positive. Neutralization test positive.
June, Butte-----	<i>Tadarida brazil- iensis.</i> <sup>1</sup>	Brain tissue positive-----	Two dogs observed playing with par- tially paralyzed bat in yard of home in Thermalito. Not known if dogs bitten. Negri negative.
August, Butte-----	<i>Lasionycterus noctivagans.</i>	Brain tissue positive-----	Partially paralyzed bat picked up by woman who was bitten and sub- sequently died of rabies. Negri pos- itive.
September, Butte---	<i>Lasiurus cinereus</i> ----	(?)-----	Partially paralyzed bat found in yard of home in Chico. Negri positive.
July, Alameda-----	<i>Tadarida braziliensis</i> ---	Brain tissue positive-----	Partially paralyzed or dead bat found by 7-year-old boys in Berkeley. Boys incurred skin punctures, but not known if due to bite. Negri negative.
July, Kern-----	<i>Tadarida braziliensis</i> ---	Brain tissue positive-----	Paralyzed bat found under bat roost in Kern Canyon. Died next day. Negri negative. Neutralization test posi- tive.

# Rabid bats found in California, January 1, 1954–December 31, 1959—Continued

Year, month, and county	Species	Results of mouse inoculation test	Remarks
November, Kern-----	<i>Lasiurus cinereus</i> ----	Brain tissue positive-----	Partially paralyzed bat found by three children in Bakersfield. Children apparently not bitten. Negri negative.
December, Imperial--	<i>Macrotus californicus</i> ----	Brain tissue and saliva positive.	Apparently healthy bat collected in survey from mine near Potholes. Neutralization test positive.
1959			
April, Alameda-----	<i>Tadarida brasiliensis</i> ----	Brain tissue positive-----	Partially paralyzed bat found during daytime floundering on garage floor of home in Centerville area. Negri negative.
May, Kern-----	<i>Lasiurus cinereus</i> ----	Brain tissue positive-----	Three of 13 apparently ill or abnormal bats captured at the Naval Ordnance Test Station, Ridgecrest, Inyokern, during daytime or early evening. All Negri positive.
May, Kern-----	<i>Lasiurus cinereus</i> ----	Brain tissue positive-----	
June, Kern-----	<i>Antrozous pallidus</i> ----	Brain tissue positive-----	
June, Marin-----	<i>Antrozous pallidus</i> ----	( <sup>2</sup> )-----	Two cats found playing with a partially paralyzed adult bat on front porch of home in San Rafael at 3 a.m. Bat bit one cat. Negri positive.
June, Marin-----	<i>Antrozous pallidus</i> ----	( <sup>2</sup> )-----	Partially paralyzed young adult bat found being played with by dog in yard of home in San Rafael during evening. Negri positive.
June, Marin-----	<i>Antrozous pallidus</i> ----	( <sup>2</sup> )-----	Young bat just beginning to fly found dead under bush by dog in yard of San Rafael home. Negri positive.
August, Marin-----	<i>Antrozous pallidus</i> ----	Brain tissue positive-----	Partially paralyzed young adult bat found being played with by cat in patio of San Rafael home at noon. Microscopic examination atypical.
June, Napa-----	<i>Antrozous pallidus</i> ----	( <sup>2</sup> )-----	Partially paralyzed bat found on ranch near Calistoga. Negri positive.
July, Napa-----	<i>Tadarida brasiliensis</i> ----	Brain tissue positive-----	Partially paralyzed bat found near Calistoga. Microscopic examination atypical.
July, Butte-----	<i>Lasiurus cinereus</i> ----	( <sup>2</sup> )-----	Partially paralyzed bat found by ranger in Bidwell Bar State Park near Oroville. Negri positive.
July, Butte-----	<i>Pipistrellus hesperus</i> ----	Brain tissue positive-----	Partially paralyzed bat found in swimming pool of Butte County Hospital, Oroville, by child. Child picked up bat and was bitten. Microscopic examination atypical.
September, Butte----	<i>Tadarida brasiliensis</i> ----	Brain tissue positive-----	Bat found being played with by cat in Chico home. Cat bitten. Microscopic examination negative.
July, Modoc-----	<i>Pipistrellus hesperus</i> <sup>1</sup> ----	Brain tissue positive-----	Partially paralyzed bat found in yard of home in Alturas. Negri negative.
August, Shasta-----	<i>Tadarida brasiliensis</i> ----	Brain tissue positive-----	Partially paralyzed bat found alive on front step of home in Redding. Microscopic examination atypical.
September, Glenn----	<i>Tadarida brasiliensis</i> ----	Brain tissue positive-----	Partially paralyzed bat found on step of school in Willows by school child. Microscopic examination atypical.
September, Ventura--	<i>Lasiurus cinereus</i> ----	( <sup>2</sup> )-----	Bat made unprovoked attack upon dog in daytime in home at Fillmore. Negri positive.
October, San Joaquin--	<i>Tadarida brasiliensis</i> ----	Brain tissue positive-----	Found moribund in street in Tracy.

<sup>1</sup> Identification of species probable.

<sup>2</sup> Results of mouse inoculation test not available.

confirmed but how the infection was incurred is not clear (29). A consultant mining engineer died of rabies in Wadsworth Veterans Administration Hospital, West Los Angeles, Calif., on June 3, 1959. He is known to have explored bat caves in the Big Bend country of Texas as possible locations for mining bat guano. Between April 17 and 28, 1959, he visited Hawkey Cave, Pecos County; Frio Cave, Uvalde County; Fern Cave, Val Verde County; and Dunbar Cave, Edwards County.

He told a friend that in one cave, believed to be Frio Cave, the bats were very numerous and he had had to hold his flashlight above his head to protect himself. During this time a bat nicked him in the face. However, prior to death he was emphatic in denying that he had been bitten by a bat or other animal. He also visited Mexico during the periods April 9-14 and May 11-14, but is thought not to have visited bat caves there.

On May 26 he became nauseated and vomited, and complained of pain in his left hand and arm. He was admitted to the hospital June 1.

The clinical history following hospitalization is one of dyspnea, Cheyne-Stokes respiration, periods of depression, continuous retching, hypersensitivity, anxiousness, sweating, hydrophobia, rapid deterioration, and death. Temperature was just above normal on hospital admittance and reached 103° F. terminally. A clinical diagnosis of rabies was reached early on June 2. Death occurred on June 3.

Microscopic examinations of brain material by the Los Angeles City Health Department and the University of California at Los Angeles Medical School were negative for Negri bodies. Mouse inoculation tests by both laboratories revealed a pathogenic agent, which killed the mice in 6 days, but examination of the mouse brains failed to reveal Negri bodies. The identity of the mouse pathogenic agent as rabies virus was confirmed by positive serum neutralization tests in mice and the finding of Negri bodies in the brains of second passage mice.

The fifth case occurred in a 44-year-old man in Wisconsin (30a). On August 8, 1959, a sleeping farmer in Blue River was bitten on the lobe of the right ear by a bat that flew in the window. On August 29 he complained of tingling and pain in the area of the right ear.

He died on the morning of September 4, 1959. Microscopic examination of brain tissue taken at autopsy revealed Negri bodies and mouse inoculation test was positive for rabies. The bat incident was the farmer's only known contact with a possible rabies vector. The bat was not identified or examined for rabies because it was eaten by the family cat.

### Bat Rabies as a Public Health Hazard

Evaluation of the role of bat rabies in the epidemiology and ecology of the disease in the United States is extremely difficult. Despite the widespread reservoir of the disease in bats the evidence of transmission from bats to terrestrial animals is negligible.

The direct public health hazard of rabies in bats is likewise somewhat difficult to evaluate. cursory review of various reports of human exposures in this country and Canada indicates at least 75 persons have been reported to have been bitten (31). The actual number of persons bitten by bats certainly is greater than the reported figures indicate. In the majority of reports which include the circumstances of the bite the bitten persons subjected themselves to exposure through handling an abnormal- or ill-appearing bat.

Few reports (6, 12, 14, 26-28, 30) indicate unprovoked attack. These circumstances closely parallel experience in California (see table).

The first recognition of bat rabies in California was made in 1954 (11). Subsequent recognitions have brought the total number to 35, comprising at least 8 species from 14 counties.

Two of the 35 were apparently normal specimens collected in surveys. Two were found dead, one in a fishpond and one on the ground. Twenty-eight were ill, partially paralyzed or moribund when found. One was disturbed, during daylight, on the ground by the bitten person.

Only two bats made unprovoked attacks, one on a boy and his grandfather and one on a dog.

Of persons exposed in California, five (three adults and two children) are definitely known to have been bitten; two children may possibly have been bitten; and three children were contacts, but apparently not bitten. Eleven do-

mestic pets (seven dogs and four cats) have been contacts to rabid bats in California. With but one exception, all persons bitten in California exposed themselves by handling bats which exhibited signs of abnormality, such as partial paralysis.

A total of 92 cases of rabies in humans were reported in the United States during the 8-year period 1951-58, of which only 3 were associated with exposure to bats, an incidence of about 3 percent. Thus, the available evidence indicates the hazard of direct transmission of rabies from bats to man is minor compared with that of transmission from terrestrial animals.

### Discussion of the Case History

The woman in the case history related earlier received what is usually considered to be an adequate course of antirabic treatment (32), initiated within 3 days after exposure. Despite the treatment, she succumbed to rabies 66 days following exposure and 49 days after completion of treatment. The case clearly represents an instance of treatment failure. The nature of the bite wounds and the size of the animal to which she was exposed would seem to preclude the possibility of implantation of an overwhelming inoculum of rabies virus. There is nothing in the woman's past history to suggest undue susceptibility to infection, such as agammaglobulinemia.

### Summary

On August 30, 1958, a woman was bitten on a finger of the left hand by a silver-haired bat (*Lasiurus noctivagus*) near Magalia, Butte County, Calif. The woman was bitten during unnecessary handling of the bat which behaved abnormally. The animal was proved rabid by the finding of Negri bodies in impressions of bat brain material and isolation of rabies virus by mouse inoculation. The patient was administered what is usually considered to be an adequate course of antirabies treatment, initiated on the third day following exposure. Treatment consisted of 3,000 units of hyperimmune antirabies serum followed by 14 doses of rabies vaccine of duck embryo origin. Although treatment was complicated by a skin rash, the

woman remained well until October 24, 1958, when she complained of numbness in the left arm and fingers and of pain between her shoulders. Her condition gradually deteriorated, becoming complicated by an ascending paralysis. Death occurred on November 4, 1958. Rabies virus was isolated from her brain and identified by serum virus neutralization test. The case constitutes an instance of antirabies treatment failure.

The case is believed to be the first fully documented instance of transmission of rabies from nonsanguivorous bat to man.

Present knowledge of the extent of the insectivorous bat rabies reservoir in the United States and five other human cases of rabies associated with insectivorous bats are reviewed. The public health hazard of rabies in insectivorous bats is discussed.

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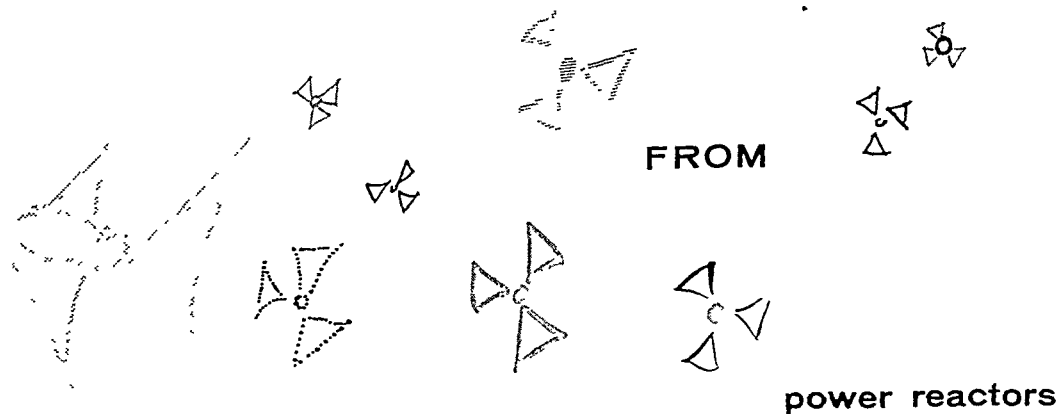
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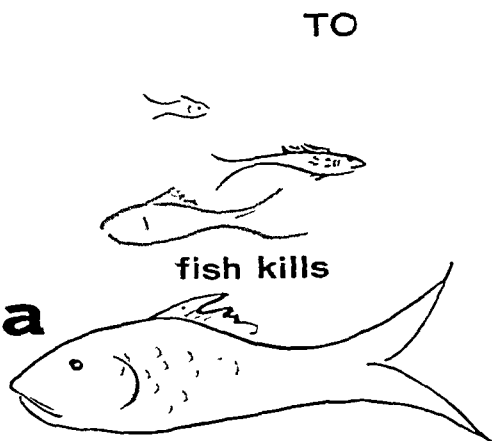
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## OVR's "Rehabilitation Record" Makes Debut

*Rehabilitation Record*, a journal to be issued every 2 months by the Office of Vocational Rehabilitation, Department of Health, Education, and Welfare, published its first number January 1960. It reviews activities of the Federal-State program of vocational rehabilitation, with emphasis on research supported by OVR. Subscription rates are \$1.75 a year (overseas, 50 cents additional), payable to the Superintendent of Documents, U.S. Government Printing Office, Washington 25, D.C.



# Environmental Health in Pennsylvania



## CONFERENCE REPORT

AT the environmental health session of the 8th Annual Pennsylvania Health Conference, papers presented ranged from power reactors to fish killings. The program chairman was Karl M. Mason, director of the bureau of environmental health, Pennsylvania Department of Health.

George Elias, regional sanitary engineer for the southeastern region, told how models of the Delaware River Basin are presently being used to predict effects of river pollution on tidal waters. The use of the model, in which the State department of health is participating

financially, removes much of the guesswork from the predictions of tidal action in the Delaware River. Some industries located in the Delaware River Basin find that wastes discharged during one period of the day are carried upstream by the tide and enter their water intakes later.

Victor Sussman, chief of the air pollution section, explained the progress of Pennsylvania's air pollution legislation currently under consideration. He drew attention to chapter 200 of the 1959 California State law which states that "The State Department of Public Health shall, before February 1, 1960, develop and publish standards for the quality of the air

of this State. The standards shall be so developed as to reflect the relationship between the intensity and composition of air pollution and the health, illness, including irritation to the senses, and death of human beings as well as damage to vegetation and interference with visibility."

"Why Bother about Silicosis?" was answered by Dr. Jan Lieben, director of the division of occupational health, who stated that the majority of the 2,957 Pennsylvanians who died of silicosis during the past 2 years were coal miners. He said that foundry workers and stonecutters also ranked high in the silicosis fatality toll. Lieben stated that deaths caused by silicosis topped the 2,032 deaths from tuberculosis, and ranked only slightly lower than lung cancer as a killer. Lung cancer caused 4,600 deaths during the 2-year period. The disease, Lieben said, results from inhalation of certain dusts. The disease is preventable and is entirely dependent on the amount and quantity of dust entering the lung tissues. Lieben said silicosis costs Pennsylvania an estimated \$15 million annually to pay workmen's compensation claims of those disabled by the disease.

On the subject of power reactors, Donald Lazarchik, sanitary engineer with the division of sanitary engineering, stated that Pennsylvania will have 13 $\frac{1}{3}$  percent of the Nation's total nuclear power generating capacity by 1963. He said, a concentrated effort in power reactor research has been in the development of pressurized water reactors similar to those used in nuclear-powered submarines and that of the nuclear power generating plant at Shippingport. The Shippingport plant, he stated, has successfully operated more than 5,000 full power hours and for the first 560 days of operation has discharged less than 6 percent of the wastes allowed by the health department in the unidentified category. Less than 2 percent of the allowable concentration of tritium was discharged, and the gaseous wastes were much less than anticipated.

Another experimental reactor is planned at Saxton in Bedford County. This power generating station is being built with the express purpose of reducing costs to levels of conventional power plants. Lazarchik stated that conventional power plants cost from \$100

to \$200 per kilowatt of installed capacity while at present most nuclear power plants cost \$300 to \$400 per kilowatt. In an effort to reduce costs to a competitive basis, 52 privately owned utility companies have formed a company known as High Temperature Reactor Development Associates, Inc. This corporation plans to build an advanced concept power plant at Peach Bottom, York County, Pa. According to the engineers, the plant looks very promising because of its simplicity, economy of operation and construction, and its inherent safety.

Lazarchik stated that the nuclear power industry produces less than 1 percent of the Commonwealth's electrical consumption and presents no problem today with widely scattered power plants. If the trend of power consumption continues to double every 10 years and we assume widespread use of the atomic power, it may be difficult to cope with the resulting problems and to determine the effect of these plants on the environment, he cautioned.

The needs in radiation research were discussed by Dr. Ursula I. Nitch of the division of occupational health. Nitch pointed out that radiation effects on man have been spotlighted in the past few years. She stated that there is no doubt that certain delayed effects are harmful to man but that human genetics are not far enough advanced to give precise answers regarding the damage to reproductive cells at various levels of radiation.

Nitch stated that most information is collected on subjects who have been exposed to high levels of radiation energy. Along these lines the State health department is studying the possible effects resulting from the use of X-rays and fluoroscopy among the patients in State tuberculosis and crippled children's hospitals. Nitch went on to say that for five decades low or moderate energy levels have been used in medical diagnostic radiology and the sum of human benefits derived can never be measured.

Recently, however, some authors have become concerned about the possible hazards from radiation in medical practice and there is some danger of hysteria in a confused public. There are 129,000 X-ray machines in Pennsylvania, 50 percent are used by dentists and the remaining half are owned and operated by medical doctors, osteopaths, chiropodists, and chiroprac-

tors, of which less than half are operated by radiologists. Of the 13 million fluoroscopic examinations, only half are done by a radiologist, the other half are performed by radiologically untrained medical doctors. Added to this figure are the 5 million radiographs and 1,900,000 fluoroscopic examinations performed annually by osteopaths, chiropractors, and chiropractists.

There is an apparent need for continuous education of professionals and the laity. At the same time, it is essential to have research into the detailed nature and magnitude of these hazards to find out:

1. How much radiation will produce given biological effects?
2. What is the relation of the age of the individual to the dose necessary for any given effect?
3. Are all end results without threshold in their inception?
4. How do the various somatic responses differ in relation to the dose?
5. What is the range of variability of response in any given group of humans?
6. To what extent are radiation responses dependent upon co-factors in the genetic and environmental profile?

Package-type sewage treatment plants are being widely adopted as a solution to waste disposal problems for suburban housing developments, joint schools, shopping centers, and industrial plants not reached by municipal sewerage systems, Arthur F. Lehmann, chief of the sewerage system section in the division of sanitary engineering, declared.

These small treatment plants generally combine a high degree of treatment with a minimum of operation, and their widespread adoption indicates that their cost is not prohibitive, Lehmann stated. "Cost of installing sewers and treatment plants usually is recoverable in the purchase price of houses in a subdivision," he said. "These small plants serve a useful purpose as an intermediate solution until trunk or interceptor sewers can be extended to pick up isolated housing developments," Lehmann added. "Package plants offer one solution to the widespread problems caused by overflowing septic tanks," he said.

The State health department is asking real

estate developers to install sewerage systems instead of septic tanks in suburban developments wherever possible, according to Thomas A. Ford, chief of the suburban development section in the division of sanitation. He told the conference that septic tanks are not suited for use in large areas of the State because of soil conditions. Before new homes are erected, Ford said, developers are being contacted and asked to report on the feasibility of tying in with municipal sewers and sewage treatment plants or constructing small interim plants. He reported that Pennsylvania is the first State to use this feasibility report system.

Habits of food servers are the target of a fresh approach to restaurant sanitation. Hugh C. Sarraf, chief of the food section in the division of sanitation, believes that the restaurant grading system which gives eating places A, B, or C ratings has outlived its usefulness since grading accomplishes only a change in equipment. He plans a study of attitudes and patterns of behavior of employers or employees. Sarraf also asserted his belief that more people suffer from poor management of food in the home than from food contaminated in restaurants.

The food section chief also revealed that State sanitarians are trying to help hospitals control the spread of staphylococcus infection.

"Who killed the fish?" is a question to be answered many times each year by the division of sanitary engineering of the department of health. Marlin E. Wilt, regional sanitary engineer for the north central region, presented a factual account of a fish killing which occurred in 1956. There are three general reasons for a fish killing: natural phenomena over which there is no control, accidents or unforeseen circumstances, and surreptitious discharges of toxins. Most fish killings are accidental or occur because of unforeseen circumstances. In some instances killings can be costly and ecologically significant. As presented by Wilt, the facts are given as the case was investigated.

*November 30, 1956:* Went to bed, expecting to go to hunting camp the next day.

*December 1, 8:48 a.m.:* Awakened by call from fish warden that 200,000 fish (trout) were killed at the Benner Springs hatchery. We agreed on sampling program until I got there.

9:35 a.m.: Notified central office to alert chemical laboratory of samples to be delivered.

12:00 noon: Arrived on scene with sample bottles, D.O. kits, and pH comparator.

4:45 p.m.: Completed sampling of stream all the way to source and placed dye in siphon dosing tank and checked flow through the night to ascertain what time pollutant was discharged. Estimated that discharge occurred at 3:00 p.m., Friday, November 30. Possible sources of stream pollution were ammonia from ice skating rink, caustic boiler water, chemicals from laboratories, or radioactive wastes from reactor. Radioactive contaminants showed negative. Met with borough officials, college officials, and collected more samples.

11:00 p.m.: Met with fish biologist.

December 2, 12:10 a.m.: Lab report shows no cyanide. Other tests being made.

4:30 a.m.: Arrived home.

8:30 a.m.: Returned to scene of killing and made more inspections of stream, sewage treatment plants, and interviewed operators. College officials agreed to carry on investigation by

continued sampling. Waited for lab results and got permission to go to hunting camp.

December 3, 10:30 a.m.: Shot a nice spike buck.

1:00 p.m.: Returned to State college, where head of physical plant informed me that all avenues of the investigation were negative except that 104 gallons of supposedly wornout plating solution had been dumped in a college laboratory sink.

December 4: Checked source of dumping with dye to determine time to reach sanitary sewer and treatment plant and interviewed people responsible for the dumping.

December 5: More meetings but no answers. Lab instructed to save old samples.

December 6: More meetings but no answers.

December 7: Lab reports that cyanide was found in original samples as well as soil samples and in the dead fish.

11:00 a.m.: Officials notified of cause.

2:00 p.m.: Press release issued.

Remarks: 50 pounds of chlorine would have effectively destroyed all the hazardous effects of cyanide and saved 200,000 fish.

## Reports of the Osteuropa-Institute

Through its Russian Scientific Translation Program, the National Institutes of Health, Public Health Service, will distribute to cooperating libraries, at no charge, selected biomedical publications issued by the Osteuropa-Institute of the Free University of Berlin.

The first publications selected for distribution are "Current Problems of Soviet Medicine" and "Blood Pressure and Subarctic Climate in the Soviet Union." The first of these volumes summarizes, through a search of the pertinent periodical literature, recent developments in such fields as helminthology, psychiatry, oncology, and otorhinolaryngology. The second volume is a compilation of data on the climatico-meteorological susceptibility of blood pressures in the human organism. A study of blood pressure records of 1,203 World War II German prisoners-of-war forms the basis for this treatise.

# Oregon's Radiological Health Program

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*This is the first of three articles describing radiological health activities in Oregon, which have emphasized steps to control radiation exposure of the public from diagnostic X-ray procedures. It provides a chronological account, from the first occupational health surveys of static eliminators in 1949 to a 2-year survey of diagnostic X-ray units in 1957-59. Observations concerning the utility of a survey of X-ray units in comparison with immediate registration and adoption of regulations are included. The two other papers will deal further with the survey of X-ray units.*

UNDER its broad health powers, the Oregon State Board of Health promulgated its first radiation exposure standards in 1948, using at first a limit of 0.5 r and later of 0.3 rem per week for occupational exposure. In 1949 the board began surveys of polonium static-eliminators and of cobalt-60 and X-ray industrial radiology sources. These activities have continued to date as part of routine occupational health plant surveys.

In 1953 the Atomic Energy Commission began notifying the board of health of all isotope shipments into the State and invited inspection of licensees. Since that date staff members of the board of health have accompanied the AEC inspector on all his visits and have thus become acquainted with each of the 40 isotope users in the State. This cooperative activity has proceeded satisfactorily as a result of close work-

ing relationships with the regional office of AEC in Richland, Wash.

Another early activity, in 1950, was a survey of shoe-fitting fluoroscopes. More than 80 percent of such units were found to be defective, and regulations requiring all units to meet stringent standards were promulgated in 1951. Periodic check of these machines continued until the summer of 1958 when a special regulation of the board of health outlawed them. No significant resistance to this step was encountered; in fact most of the shoe merchants testifying at a board hearing favored it.

Also in 1950 the Oregon Civil Defense Medical Department was created, and a civil defense advisory board was appointed. Beginning in this same year, training courses in radiological monitoring have been conducted for high school teachers and other personnel. Interest in civil defense and the presence of a full-time medical civil defense officer on the board of health staff served to stimulate interest in radiological health. Coordination of the radiological health program with routine civil defense activities has continued to date.

Beginning in 1953 the division of sanitation and engineering of the board of health has collected and analyzed air for radioactivity from local stations in cooperation with the Public Health Service's community air pollution program. After 1956, sampling stations in Portland and 300 miles distant at Klamath Falls continued this work as part of the National Radiation Surveillance Network operated by the Public Health Service. In addition, the sanitary engineering division has conducted modest surveys of radioactivity in air and water and a few special studies on potentially contaminated local water sources.

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The director of the division of sanitation and engineering is a member of the Columbia River Advisory Group to the AEC and has worked with a Public Health Service advisory group on Columbia River problems arising from potential contamination by the Hanford Atomic Laboratories in Richland, Wash. Following a special meeting with the AEC in 1957, standard procedures in the event of accident were agreed upon.

Throughout this early period there was frequent contact between the Oregon State Board of Health and the Public Health Service, as the Service expanded its own radiological health activities. A number of Oregon staff members attended short courses dealing with specific aspects of radiological health given by the Service in Cincinnati and elsewhere.

### **Radiological Health Law**

Initial planning for a comprehensive radiological health law in Oregon began in 1955, when it was realized that States would have to assume responsibility for control of health hazards that might result from large-scale industrial application of nuclear energy and isotopes. Preparation of the law was undertaken by the occupational health section with participation of the division of sanitation and engineering and the State health officer.

Early in 1956, a study was made of laws and regulations dealing with radiation in other States. Particular attention was given to the "model" legislation suggested in "Regulation of Radiation Exposure by Legislative Means," prepared by the National Committee on Radiation Protection (1). Valuable conceptual guidance was found in materials published by personnel of the Public Health Service (2, 3) and by others (4, 5). Proposed legislation in other States, Michigan, for example, also was considered (6-9). Good general information has been published since the original planning of the bill (10-12).

It has been the conviction of the Oregon Board of Health from the beginning that radiation exposure of the public is a health problem and a logical responsibility of the health department, rather than of a special commission or other State agency. With this as its major

provision, the first draft of the proposed bill was written in April 1956 and circulated to interested local radiologists, members of the American College of Radiology, and individuals in the National Bureau of Standards, the Public Health Service, and the AEC. Favorable comments and helpful suggestions were received in reply.

In conformance with the model legislation, which was the basis for the Oregon law, the first draft called for registration of all radiation sources. Following a review of the bill by the State medical society, which obtained a specific statement on the draft from the Oregon Radiological Society, this provision was dropped. Initially the radiologists consulted favored registration, but after further discussions they reconsidered their recommendation. The board of health agreed that the requirement was probably not indicated at the outset.

The medical society suggested that a 2-year "study" of the radiological health hazards be made before promulgation of any regulations in Oregon. In retrospect this turned out to be a sound step. By "study" was meant more than a committee review of the expected problem. It meant an actual field survey of a substantial sample of all sources of exposure, including diagnostic X-ray units.

A leading local radiologist provided continuing assistance in the development of the legislation and, later, in the survey of diagnostic X-ray units. Through him, early cooperation was obtained from the medical society and also from the Oregon radiological group. Liaison with the Oregon State Dental Association was established through the efforts of a local radiodontist who had already initiated considerable interest in dental X-ray hazards in Oregon. Support of the proposed legislation was also obtained from a special committee on radiological health appointed by the chairman of the Portland Chamber of Commerce Health Affairs Committee, himself a radiologist, at the time the board of health began work on the bill.

We cannot stress too much the importance of maintaining close working relationships with local professional societies if a radiological health program is to operate smoothly and successfully. This does not mean that all steps will be readily approved or welcomed by them.

but if they are represented in planning and kept fully informed of proposed activities, solutions can often be worked out that are likely to be supported by the professions as a whole. In November 1956 an ad hoc advisory committee composed of advisers mentioned previously plus a representative of industries using radiation devices and the physician in charge of nuclear medical activities at the local medical school was organized to advise the board of health on radiological health matters.

A final draft of the bill was enacted into law in January 1957. The strong support of the professions represented on the advisory committee was a major factor in its acceptance, with only minor revisions and clarifications, by the legislators. Briefly, the Oregon radiation law contains the following provisions.

The State board of health is authorized to promulgate regulations and standards required to control any harmful effects of radiation in Oregon after completing a 2-year study of radiation exposure. All sources of radiation, except certain small quantities of material exempted by the law's definition of "radiation," are covered. Provision is made for enforcing the regulations through court injunctions and penalties, if necessary. The act also requires the State board of health to appoint a radiation advisory committee of five experts.

The Oregon radiation law, it should be noted, does not state specific exposure limits or technical requirements. These are to be included in regulations, thus allowing greater flexibility.

Because of financing problems, appropriation provisions for the proposed program were submitted in a separate bill, which unfortunately did not pass. However, even without this bill, substantial achievements had been realized: the radiological health problem had been recognized in Oregon, a study authorized, and provisions made for establishing standards.

The State board of health appealed to the Surgeon General of the Public Health Service for assistance. In response several consultants from the Division of Radiological Health visited Oregon, and in February 1958 a trained radiological health officer of the Service was assigned to assist with the program. Immediately after the statute became effective on July 1, 1957, the ad hoc advisory committee was ap-

pointed as the official Radiation Advisory Committee specified in the law. Much credit for the success of the radiological health program must go to the members of this committee.

### The Survey

It was immediately recognized by the Radiation Advisory Committee and members of the health department that conducting a 2-year study of radiation exposure would be a sufficiently large and technical undertaking that expert assistance would be essential. This would be particularly true for a survey of diagnostic X-ray units since professional acceptance and support would have to be developed before individual cooperation could be obtained. This impression was amply confirmed by experience in the succeeding months.

In early 1958 the newly assigned radiological health officer from the Public Health Service and the director of the occupational health section of the board of health began detailed planning for the survey of diagnostic X-ray units. Using Federal funds, the State provided a single full-time assistant who had attended one of the short courses in radiological health given by the Public Health Service. With National Bureau of Standards Handbook 60, "X-ray Protection," as a basis, field procedures were formulated and trial runs initiated. After refinement, the forms and techniques were discussed with the Radiation Advisory Committee, which suggested a review by a board-certified radiological physicist, who is a specialist engaged by radiologists to check their units. The consultation was of real value technically. It also served to assure the radiologists and other professional groups that our plans were reasonable and supported by the necessary technical competence.

Conferences were then held with biostatisticians of the board of health in regard to choice of sample, and a routine method for conducting the survey was worked out. Dr. Stahl took part in all early field surveys and personally checked most of the physicians' and radiologists' units. The field staff was given special training concerning routine X-ray practices and medical and dental terminology and received detailed advice as to interpretations of



radiation hazards and relative magnitude of various exposures before they conducted surveys without supervision.

Before the fieldwork was started, several meetings were held with representatives of X-ray equipment distributors in the area. Such dealers play an important role in maintaining X-ray equipment. They are well informed on the practical problems of diagnostic radiology and can offer much valuable advice on what will or will not work successfully in practice.

The results of the study confirmed previous impressions that radiation exposure can be materially reduced by use of equipment and techniques recommended by many radiologists. (Results will be presented and discussed in detail in a later paper.) What is perhaps more important, however, the survey allowed us to develop good working relationships with various professional groups. When obtaining data, we offered suggestions on radiation protection equipment and techniques. In other words, although no regulations were in force, the survey effected some of the benefits of a control program because of its educational value. There is considerable evidence that this voluntary approach will produce as good results as, perhaps even better than, would be obtained by compulsory registration and regulation of X-ray equipment alone. A registration program, of course, if properly interpreted to the professions, need not preclude a voluntary survey with its educational benefits.

### Regulations

As specified by the Oregon law, regulations can be promulgated by the board of health after completion of the survey in August 1959. As background, we give the following summary of regulations in other States, based on information readily available (6,7,9). Because changes in this field are occurring rapidly, the figures are not precise.

Of the 13 States requiring registration of radiation sources, 6 or 7 specify registration of all diagnostic X-ray units. Thirty-four States have advisory groups on radiation and are presumably considering diagnostic X-ray exposure along with other possible sources. Seven

States have comprehensive radiation codes specifying limits on exposure for all types of personnel, and a number of others have set such limits as part of existing occupational health or other codes. Only New York, Michigan, Pennsylvania, and California have regulations covering the equipment to be used in diagnostic X-ray work. Several States forbid chiropractors and certain others to use X-ray for diagnosis.

The board of health and its advisory committee on radiation are considering various possible regulations. The general outlook is briefly as follows. There is an undeniable need for regulations regarding radioactivity in air and water, transportation of radioactive material, sale of objects containing radium and radioisotopes, and contamination of food. It would seem reasonable to set uniform occupational exposure standards that will include exposure of personnel in medical and other professional offices. Such regulations may not require continuous monitoring but instead specify frequent spot checks to determine average doses.

On the basis of our field experience, regulation of mechanical devices used with X-ray machines does not appear technically feasible or particularly desirable. Only a few of the many steps that can be taken to reduce radiation exposure of patients are amenable to simple regulation. Most require continuing, active cooperation by the user of the unit, which cannot be guaranteed in practice by rules or standards, but must depend on education and understanding of the hazard. Limits on occupational (and nonoccupational) exposure do not automatically assure the use of protective devices.

On the question of compulsory registration of radiation sources, Oregon is cautiously examining the advantages and disadvantages. The most commonly advanced argument for registration is that it provides a complete and up-to-date listing of all radiation-producing units and also provides the opportunity for bringing the accepted standards to the attention of their owners. We do not believe, however, that 100 percent registration can be accomplished without legal action, and such action is incompatible with present circumstances in Oregon. Further, Oregon officials feel that compulsory

registration may engender animosity and make those who refuse to register inaccessible to further contacts.

We have found it possible to locate at least 90 percent of all radiation sources in the State without registration, through the use of professional society listings and the classified telephone directories. Like other States, we are kept informed of shipments of radioactive materials by the AEC and the Radium Corporation of America, and the occupational health program routinely surveys other industrial and some laboratory radiation sources.

Promulgation of uniform occupational exposure standards would probably have widespread effect. Violating these standards, for example, might provide support for legal action in the event of possible late-appearing injuries. Adherence to them, on the other hand, would constitute considerable protection against such claims. The existence of standards would doubtless become widely known among X-ray technicians, labor unions, and others who would encourage adherence to them. Occupational exposure regulations are not likely to be regarded as interference with the normal practice of any of the professions concerned.

### **Coordination of Activities**

In the spring of 1958 a plan for coordination of all radiological health activities of the Oregon Board of Health was formulated. The main goal was to define possible hazards and delineate the exact responsibility of the several sections of the health department in investigating each. A working understanding was developed without difficulty among occupational health, civil defense, and sanitation and engineering programs, which has facilitated solution of many practical problems such as use and location of the single laboratory counter, calibration sources, and other instruments.

In addition, the health department is coordinating its activities with those of other agencies that have an interest in radiological hazards. At present, these include the State Departments of Agriculture, Aeronautics, Education, and Labor; the State Industrial Accident Commission; the State police and the fire marshal; and the Port Authority. Contact will be or

has been established also with Federal agencies: the Public Health Service, the Department of Defense, the Interstate Commerce Commission, and the AEC, for example.

Advisable under any circumstances, such interagency coordination is particularly necessary if the health department is given primary responsibility for radiation health problems arising from all sources. Industrial development, using nuclear energy or radioisotopes, of course, is an entirely different matter and should be separated from surveillance of radiation hazards, we feel, to insure objective appraisal of potential health problems.

Informal personal contacts, as well as meetings of small groups, are effective in achieving the desired coordination. Unwieldy new administrative organizations should be avoided.

Professional education, as already indicated, is basic to a radiological health program. In addition to the work with X-ray technicians, dentists, and physicians in connection with the survey of X-ray units, we have held lectures and demonstrations for X-ray technicians, physicians, veterinarians, radiologists, and others.

Education of the public is also essential. To avoid misunderstanding, however, great care must be taken in framing statements for public use, particularly those dealing with highly technical matters. A statement that is misinterpreted could seriously impede radiation control activities.

### **Summary**

Major accomplishments in the development of a radiological health program in Oregon include enactment of a law giving the board of health broad responsibilities for control of all sources of radiation and for conducting a 2-year survey of diagnostic X-ray units. Close liaison with various State and local professional groups, achieved with the aid of an active Radiation Advisory Committee of outside experts, has proved of great assistance.

Regulations are to be promulgated by the board of health after completion of the survey. An undeniable need is recognized for regulations concerning environmental contamination, occupational exposure, and acci-

dents involving radioisotopes. No decision has been reached concerning uniform registration of sources.

A formal plan clearly specifying responsibilities and areas of activity has been established for coordination of the work of various sections of the health department. Both professional and public education, considered basic in a radiological health program, have received attention.

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- (1) U.S. National Bureau of Standards: Regulation of radiation exposure by legislative means. Handbook No. 61. Washington, D.C., U.S. Government Printing Office, 1955.
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- (3) Chadwick, D. R.: Radiation exposure, a public health problem. *Bull. Kentucky State Dept. Health* 31: 8-14, July-August 1958.
- (4) Association of State and Territorial Health Officers: Policy on radiological health. Richmond, Va., September 1957.
- (5) Radiological health. Conference Report. *Pub. Health Rep.* 72: 1113-1120, December 1957.
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- (11) Powell, C. C.: Radiation hazards. *Am. J. Pub. Health* 49: 1-9, January 1959.
- (12) Symposium of radiation exposure. *Am. J. Roentgenol.* 78: 939-999, December 1957.

### Institute on Chronic Disease Control

A 2-week institute on chronic disease control will be held June 13-24, 1960, at the University of Michigan School of Public Health. Co-sponsors of the institute are the directors of chronic disease teaching programs of schools of public health, the Association of State and Territorial Chronic Disease Program Directors, the Michigan Department of Health, and the Public Health Service.

Lectures, seminars, and discussions on health promotion, prevention, early detection, multiple screening, home care, institutional care, and rehabilitation, in such chronic diseases as heart disease, cancer, diabetes, glaucoma, and cerebral vascular disease, will be included in the program.

The institute is designed primarily for public health physicians in chronic disease control programs, but selected public health nurse consultants, nutritionists, and health educators who plan and administer such programs at State and local levels also are eligible to attend.

Attendance will be limited and applications for participation must be received not later than May 15, 1960. Additional information may be obtained by writing to the Director of Continued Education, School of Public Health, University of Michigan, Ann Arbor.

*An analysis of available data on diet shows little group variation in the consumption of fats and oils between populations of urban and rural areas and between income groups in the United States.*

## Fat Consumption in the United States

FREDERICK H. EPSTEIN, M.D.

VITAL STATISTICS show wide variation in arteriosclerotic heart disease mortality among different States of the Union (1). Such variations, if real, might be related to differences in dietary habits, particularly with regard to fat consumption. The U.S. Department of Agriculture has published extensive tables on food consumption based on household interviews conducted in the spring of 1955, which permitted testing for differences among the four major regions of the Union (North East, North Central, South, and West), between urban and rural areas, and between income groups (2). Variations in the quantity or types of food consumed among the population segments thus defined would be of help in identifying groups suitable for more detailed epidemiological studies of the relation between nutrition and cardiovascular disease.

This analysis of the U.S. Department of Agriculture data searches for such variations. It was realized, however, that the original survey was intended to serve a quite different purpose, that is, to collect information "for administration of public programs affecting food supply, distribution and consumption; for educational programs to improve food habits, and for private efforts to broaden and improve the

marketing of foods" (2, 3). Data collected for one purpose do not necessarily lend themselves to analysis for another. Yet this study seemed justified in view of the paucity of detailed information on the food habits of subgroups of the general population in the United States and their possible relation to disease patterns, particularly atherosclerosis.

Several publications of the U.S. Department of Agriculture have summarized part of the information culled for the survey (4-7). In particular, the average fat consumption in the four major regions, North East, North Central, West, and South, was analyzed in terms of saturated and unsaturated fatty acid content but no breakdowns by degree of urbanization and income were made (5, 7). Our data present a systematic and simultaneous analysis of almost all relevant fat-containing food items in the diet by region, by degree of urbanization, and by income group. Moreover, the data given in the tables published by the U.S. Department of Agriculture refer to average household rather than per capita consumption, regardless of the fact that certain food items are eaten only by a proportion of the population. In this analysis, data are presented for per capita consumption among users only.

Our findings suggest that major overall dietary habits of fat consumption vary remarkably little among different broad segments of the general population within the United States, a significant observation from the point of view

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*Dr. Epstein is associate professor of epidemiology, School of Public Health, University of Michigan. This study was supported by a grant from the National Heart Institute, Public Health Service.*

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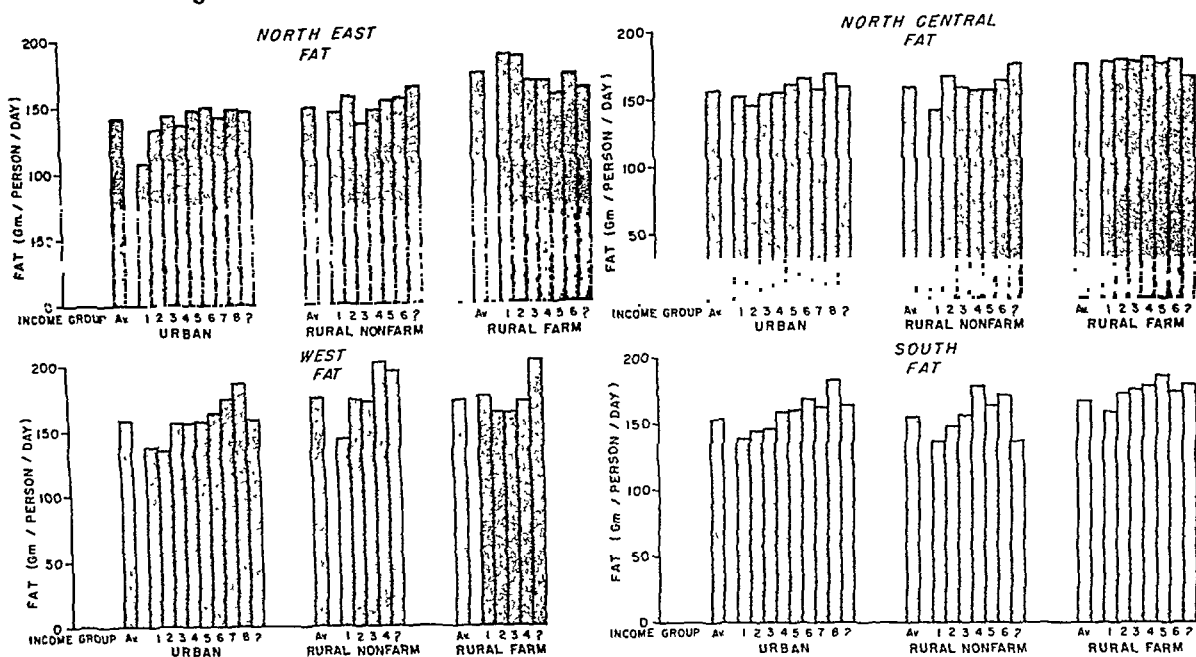
A 2-week institute on chronic disease control will be held June 13-24, 1960, at the University of Michigan School of Public Health. Co-sponsors of the institute are the directors of chronic disease teaching programs of schools of public health, the Association of State and Territorial Chronic Disease Program Directors, the Michigan Department of Health, and the Public Health Service.

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Figure 1. Total fat consumption in four regions of the United States



**ANNUAL INCOME.** In urban areas: Group 1, under \$2,000. Group 2, \$2,000-2,999. Group 3, \$3,000-3,999. Group 4, \$4,000-4,999. Group 5, \$5,000-5,999. Group 6, \$6,000-7,999. Group 7, \$8,000-9,999. Group 8, \$10,000 and over. In rural areas, except in the West: Same as

in urban areas except for group 6 which refers to incomes of \$6,000 and over. In rural areas in the West: Group 1, under \$2,000. Group 2, \$2,000-3,999. Group 3, \$4,000-5,999. Group 4, \$6,000 and over. Incomes not classified denoted by question mark.

the variations inherent in the method of data collection.

In summary, there is a considerable degree of uniformity in average caloric, protein, and fat intake, irrespective of region (North East, North Central, South, or West) or area (urban, rural nonfarm, and farm). However, caloric intake tends to be lower in the two more urban areas in the North East, and there is a distinct tendency for all three variants to show a positive correlation with income in the two more urban areas in the South and West and possibly in the other two regions as well.

### Fats and Oils

The "total fats and oils" category includes butter, margarine, shortenings, salad dressings, and salad and cooking oils. Household fat consumption increases with diminishing degrees of urbanization in all four regions (fig. 2). This trend, as well as the higher consumption in the South, reflects household size.

Since differences in average household consumption tend to reflect differences in household size rather than true differences in consumption between groups, only per capita consumption will be discussed. Household data may be obtained from the detailed tabulations. Per capita consumption of fats and oils is strikingly similar in all regions and within comparable areas and income groups, except for a somewhat lower level in the urban North East, where total caloric and total fat consumption are also lower. In each region, except in the West, consumption per person is lowest in the urban and highest in the rural areas.

Baked products, not being primarily fat-containing, have been excluded from this analysis. While the consumption of baked products and prepared foods is known to be higher in urban than rural areas (6), it is unlikely that their inclusion would have materially altered the general picture of fat consumption. Baked goods form but a part of the category of "grain products," a group which, even as a whole, accounts

of epidemiological research into the causes of atherosclerotic diseases.

### Methods of Analysis

The tables on "Dietary Levels of Households" were used for the determination of total calorie, fat, and protein consumption (3). Individual food items were analyzed, using the tables on "Food Consumption of Households" (2). These tables provide data on average consumption in households and also the average number of persons per household in different regions and groups. Thus by dividing household consumption by household size, per capita food consumption of the total segment of the population under consideration may be calculated.

A further correction is required for calculating consumption among those actually using the food item in question. This can be accomplished by dividing the average per capita consumption by the percentage of "users," a figure also given in the tables. An error may be introduced by this method since it tacitly assumes that household size is the same among users and non-users, not necessarily a correct assumption. Thus, in Great Britain at least, it has been shown that the number of children in a family, a decisive factor in household size, is more critical than social status in determining food habits (8). In defense of using the correction in question, it may be said that the average household size in the four different areas of comparable urban and rural localities is generally so similar (3 to 4 persons per household) that the assumption of comparable household size among users and non-users may produce no more or possibly even less error than the uncertainties inherent in gathering the basic dietary information, or the inevitable failure to adjust for the varying ages among the household members.

The basic data refer to food consumed rather than food purchased. Nevertheless, there is likely to be some overestimate of intake because of "food waste," a quantity notoriously difficult to gauge. Uncertainty regarding food waste is particularly troublesome in estimating fat intake.

Eighty-eight charts have been prepared. Twelve of these depict the intake of calories,

protein, and fat in the four major regions. The remaining 76 charts pertain to household and per capita consumption of 19 different fat-containing food items. Each chart represents one of the four regions. Each of the 88 charts includes breakdowns into the three degrees of urbanization, urban, rural nonfarm, and rural, and, within these, different income groups.

### Calories, Protein, and Fat

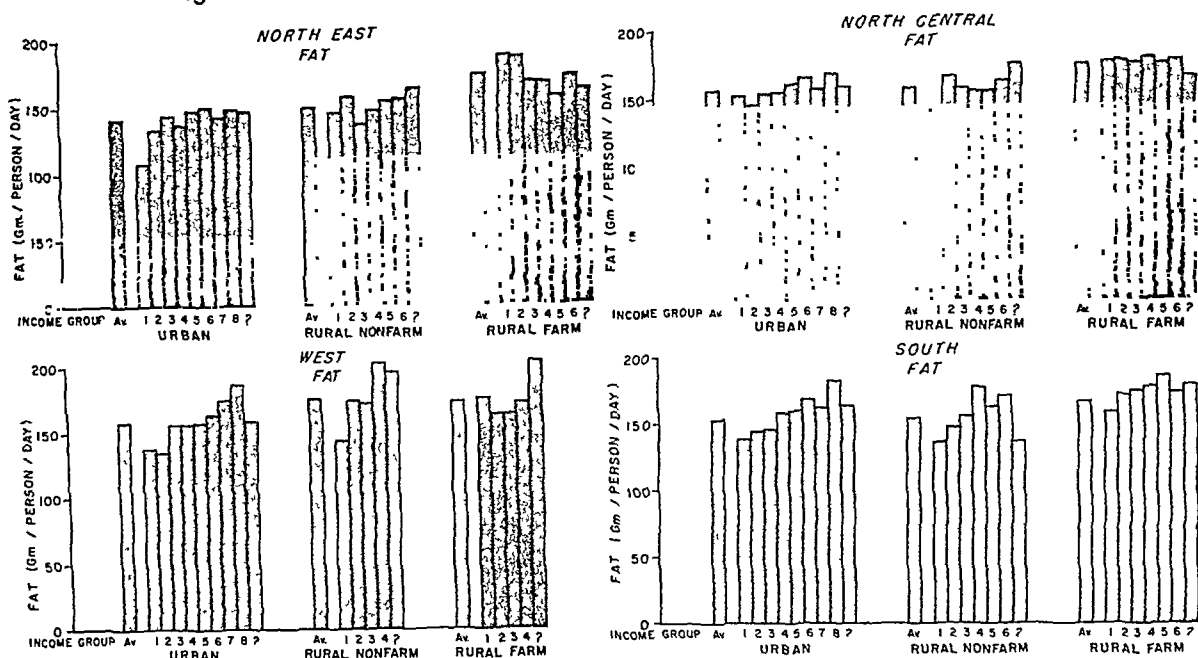
The large number of charts precluded publication in their entirety. Instead, a summary of each set of charts is presented, including some representative diagrams for illustration (figs. 1 and 2). Brief, descriptive annotations of the charts are obtainable from the author upon request.

Average total caloric intake tends to be somewhat lower in the urban and rural nonfarm areas of the North East than in the comparable areas of the three other main regions of the country. There is a general tendency for caloric intake to increase, moving from town to country; intake in the farm areas is uniformly highest, including the North East. There is no discernible association between caloric intake and income level, except for a slight positive correlation in the urban North East and in the urban and rural nonfarm areas of the South and West.

Average protein intake seems to be no different by region or area, except for a somewhat lower intake in urban and rural nonfarm areas of the South. In the same areas in the South and the West, the protein intake tends to rise with income; a less definite but suggestive correlation with income is noted in the two urban areas of the North.

The trends for total fat and protein consumption are similar except that farm consumption usually tends to be higher than urban and rural nonfarm consumption (fig. 1). As in the case of protein, fat intake tends to rise with income in the urban and rural nonfarm areas in the South and West, income group 1 denoting the lowest and income group 8 the highest level. It is difficult to decide from inspection of the graphs whether any of the less obvious differences between income groups are significant statistically or nutritionally, taking into account

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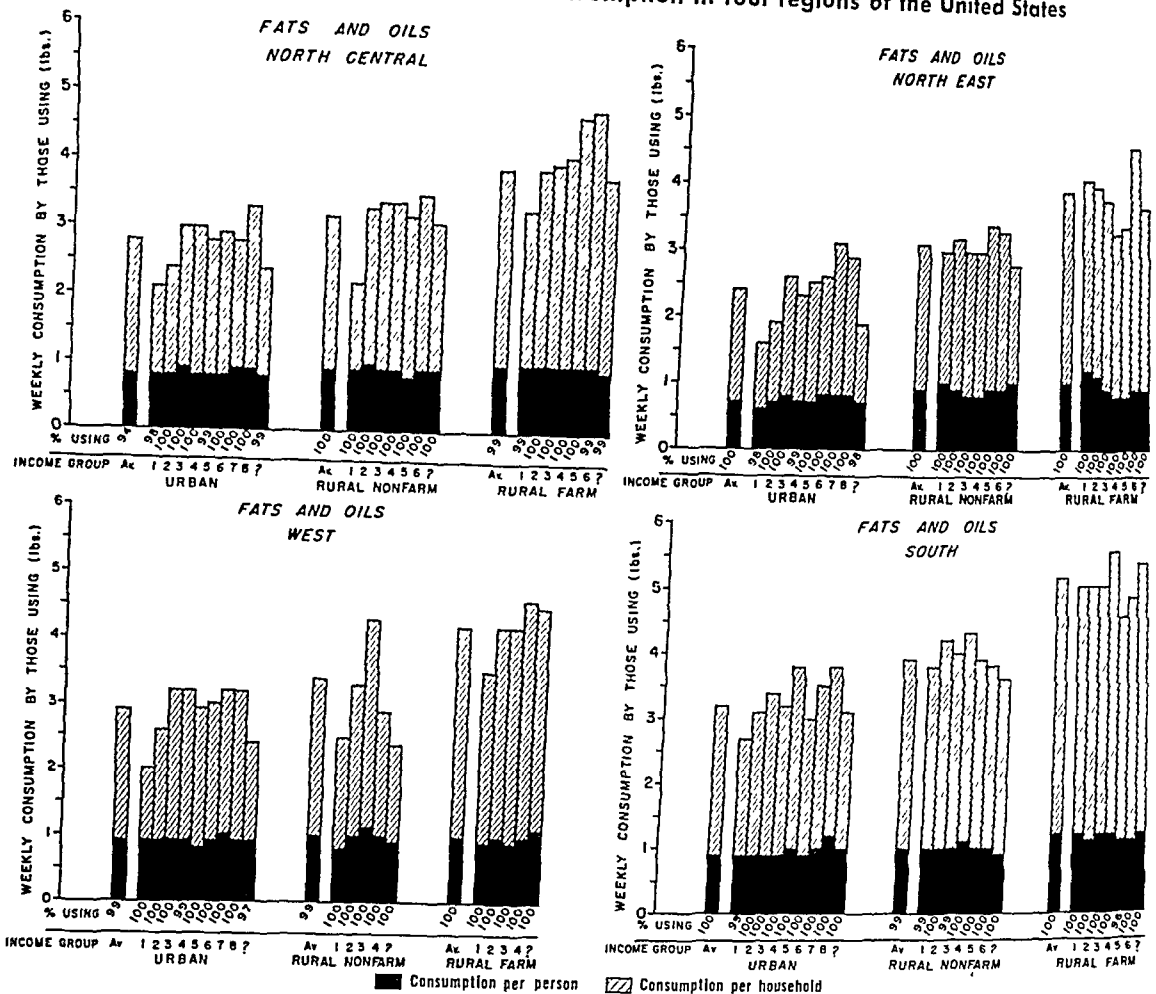
The "total fats and oils" category includes butter, margarine, shortenings, salad dressings, and salad and cooking oils. Household fat consumption increases with diminishing degrees of urbanization in all four regions (fig. 2). This trend, as well as the higher consumption in the South, reflects household size.

Since differences in average household consumption tend to reflect differences in household size rather than true differences in consumption between groups, only per capita consumption will be discussed. Household data may be obtained from the detailed tabulations. Per capita consumption of fats and oils is strikingly similar in all regions and within comparable areas and income groups, except for a somewhat lower level in the urban North East, where total caloric and total fat consumption are also lower. In each region, except in the West, consumption per person is lowest in the urban and highest in the rural areas.

Baked products, not being primarily fat-containing, have been excluded from this analysis. While the consumption of baked products and prepared foods is known to be higher in urban than rural areas (6), it is unlikely that their inclusion would have materially altered the general picture of fat consumption. Baked goods form but a part of the category of "grain products," a group which, even as a whole, accounts



Figure 2. Separated fat and oil consumption in four regions of the United States



NOTE: For annual income of the groups see figure 1.

for no more than 5 to 7 percent of the calories derived from fat in the different regions and areas (3). It is not implied that baked products are an unimportant source of fat or calories for some people or groups.

It is clear that the total consumption of separated fats is high, regardless of region, degree of urbanization, and income. The types of separated fats contributing to this total picture might be suspected to differ appreciably among the various population groups, but further analysis gives little support to this hypothesis. When the consumption levels of butter, margarine, shortenings (lard and nonlard), salad dressings, and salad and cooking oils are charted individually, no striking differences among regions, areas, or income levels emerge. More-

over, since the proportion of users of these various types of separated fats is reasonably similar from one region, area, or income level to the next, these observations rule out major inter-group differences in the food patterns under discussion. Yet some differences must exist since we must assume that the non-users of one particular type of fat substitute another, for example, vegetable shortening for lard, if we are to account for the similarity in total fat and oil consumption among different subgroups. The basic tabulations do not provide the breakdowns necessary for such an analysis, which was beyond the scope of the original purposes of the survey as explained. Nevertheless, significant group variations in this regard may well exist. Thus, although relatively few households use

salad and cooking oils, consumption tends to be high among those who do, presumably at the expense of the more saturated forms of fat.

### **Dairy Products**

Detailed tabulations have been made for milk (fresh fluid and evaporated), cream, ice cream and ice milk, cheese, and eggs. In general, the findings are similar to those for separated fats. Little variation in consumption level has been encountered among the users in the different regions, areas, and income groups. Likewise, for each given dairy product, the percentage of users tends to be comparable from one population subgroup to the next. Rural areas in general and the South are exceptions. Consumption is higher in farm districts and lower in the southern States. Within the dairy products group, there is less room for substitutions than in the "fats and oils" category and there is even firmer ground for stating that there are no major intergroup differences in consumption.

### **Meat, Poultry, and Fish**

As in the case of fats and oils and dairy products, the economic leveling process has tended to equalize differences in meat, poultry, and fish consumption. Exceptions are a lower meat consumption in the South, at all degrees of urbanization, and a slight positive association between meat consumption and income. Also, the proportion of households using fish is higher in the North East. The present findings are not in accord with the statement that meat is of lesser importance in rural diets (5). The data in support of this claim are based on the total category of "meat, poultry, and fish" and, not being expressed as per capita consumption of users, can be explained by the fact that the proportion of users of poultry and fish is higher in urban than rural areas.

### **Comments and Recommendations**

It would seem permissible to conclude from these data that selected income groups in certain regions and areas of the United States do not appear to offer themselves as units for more detailed study of the relationship between fat

intake and coronary heart disease. Yet, it is likely that there are more narrowly defined cultural and religious subgroups within the United States differing sufficiently in dietary habits to permit a study of the relationships between diet and disease in this country which might be more easily interpreted than certain international comparisons.

There is also a need for concurrent clinical and dietary studies among populations or representative population samples, using methods of dietary history taking of adequate validity and reliability, in order to delineate differences in dietary habits between individuals within the same group rather than searching for differences between groups. In this light, the original interview records collected in the survey by the U.S. Department of Agriculture may still offer opportunity for more detailed scrutiny.

Originally it was hoped that information on the type and amount of fat-containing food-stuffs would provide an indirect measure of the degree of saturation of fats in the diet of a given group. It seemed too difficult, however, to gain a consistent picture of dietary fatty acids content by reconstructing the contributions of individual food items. Stiebeling has analyzed the survey data on fats in terms of saturated, oleic, and linoleic acid content in the four regions but provided no further breakdown by degree of urbanization or income, nor did she correct for the effect of non-usage (7). This analysis suggested a somewhat higher ratio of unsaturated to saturated fatty acid in the South; the other three regions showed no appreciable dissimilarities in this regard.

It is not possible to extrapolate these findings to the more detailed ramifications of the populations into the areas and income groups discussed here. If the general conclusion is correct that no major differences in the consumption of fat-containing foods exist between the population segments considered, the same conclusion would generally apply to the constituent fatty acids.

### **Summary**

An analysis, based on the household food consumption survey made by the U.S. Depart-

ment of Agriculture in the spring of 1955, of the consumption of calories, protein, and fat, and the major fat-containing foods, has been made. The consumption of "fats and oils," "dairy products," and "meat and fish" has been broken down into 19 different food items. For each of these, data are presented on the proportion of users of the various foods, their consumption level among the households using them, and the per capita consumption by the users. These data are further broken down by the four major regions of the United States, degree of urbanization, and income level. This report, differing in aim from others published, is based on calculations including only households actually using the food item rather than averages for the total group regardless of the proportion of users.

Epidemiological studies into the relationship between fat intake and atherosclerosis aim at delineating population segments differing in fat intake. The present analysis was undertaken in the hope that the extensive and detailed fragmentation of the total population by region, area, income, and proportion of users might identify subgroups exposed to possible preferential risk by a high intake of certain fats. Allowing for methodological difficulties, no such susceptible population subgroups could be shown to exist in the United States in terms of the particular breakdowns made. The feasibility of epidemiological studies of the kind envisaged within the United States would seem to depend, therefore, on identifying intra-group differences between individual members of the community rather than intergroup differences between broadly defined regional or socioeconomic population segments.

#### DOCUMENTATION NOTE

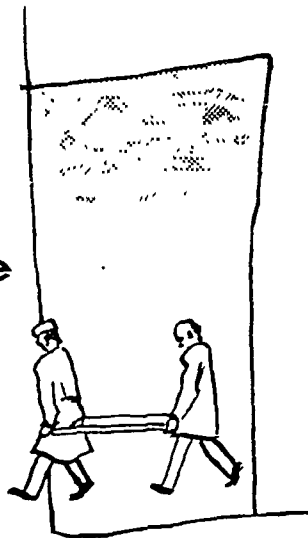
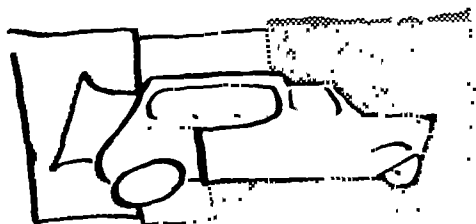
The complete set of 88 charts and the tables from which the charts were drawn, covering variations in

the fat and oil consumption among the population segments defined by the U.S. Department of Agriculture survey of diet in the United States by household interview, have been deposited as document No. 6142 with the American Documentation Institute Auxiliary Publications Project, Photoduplication Service, Library of Congress, Washington 25, D.C. A photoprint may be obtained by remitting \$25; a 35-mm. microfilm copy by remitting \$7. Cite document number. Advance payment is required. Make checks or money orders payable to Chief, Photoduplication Service, Library of Congress.

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# Ambulance Service



## in Seattle

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### Survey of Service

**I**N 1953, Seattle, Wash., began to appraise the King County emergency ambulance service on the basis of costs, efficiency, and in relation to traffic hazards. Traffic casualties were singled out since they represent more than two-fifths of the total accidental deaths in the United States and are the main recipients of emergency ambulance service (1).

Since 1892, Seattle, Wash., has recognized the importance of ambulance service for its residents. Back in those days, the ambulance was a wagon used to carry patients to the small-pox isolation hospital, known as the "suspect house." Today 20 well-equipped ambulances are supplied by four independent privately

owned companies to answer emergency calls in the city.

A supplementary survey was conducted in July 1958 to compare the ambulance service in Seattle with other cities. A questionnaire prepared by the Seattle-King County Health Department was distributed to the 113 cities in the United States and western Canada whose estimated population numbered over 100,000. Ninety-nine local health departments, or 88 percent, returned the questionnaires, and their answers supplied the following information:

- Thirty cities rely solely on city, county, or State-owned equipment to supply ambulance service. Further communication with these cities revealed that their equipment varies from the typical ambulance to station wagons, vans, and specially equipped police cars.

- Thirteen cities use private companies under contract at a fixed annual fee as their exclusive suppliers of ambulance service.

- Thirty-two cities use privately owned ambulances without any formal contract arrangement. In some cases, this service costs the city

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**Table 1. Percentage distribution of emergency reporting sources in Seattle, Wash., 1956-58**

Reporting service	1956		1957		1958	
	Number	Percent	Number	Percent	Number	Percent
Private physician.....	28	0.6	11	0.2	15	0.3
Telephone operator.....	7	-----	8	-----	14	-----
Citizen.....	606	13	639	13	516	10
Police.....	3,799	81	3,965	81	4,193	85
Other.....	279	6	280	6	201	4
Total.....	4,719	-----	4,903	-----	4,939	-----

nothing, since only private companies operate, with no official city intervention or contract. In others, the city reimburses the private ambulance owner on a per call basis.

• Twenty-three cities make use of several types of ambulance service, supplementing municipally owned vehicles with privately owned or contracted ambulances.

The annual cost of ambulance service does not seem to correlate with population, number of vehicles, calls per year, or type of service used. In many cases, cost estimates are unavailable, especially when the ambulance service is a division of the police department with patrol cars and personnel used for both emergency calls and police business.

In most cities, the police work closely with ambulance services. In 60 cities, dispatching is done by the police department. The role of the police dispatcher is an important one. A patrol car is usually called to the scene of an emergency before an ambulance, whether the emergency is a traffic accident, street fight, or other unusual disturbance. The patrolman ascertains the need for an ambulance, orders the dispatcher to send one, and attests to the need for speed and the use of a siren. The fire department dispatches ambulances in 7 cities, and 23 cities rely on a telephone call to start the emergency vehicle on its way.

### Growth

Seattle's ambulance service has improved with experience and growth. In 1899, the board of health asked the city council to establish an ambulance service officially (2, 3).

Eighteen years later, in 1917, the annual re-

port of the department of health carried the following paragraph:

"The ambulance service has been very efficient during the past year. We have one well-equipped ambulance that answers any emergency call to any part of the city. There is only one cot in the ambulance but, when necessary, two patients can be transferred. There is in the ambulance, a lung motor, emergency kit with all necessary instruments, medicine and dressings for any emergency case, and also padded emergency splints for fractures. They can be temporarily applied for the transportation. The ambulance is driven by the police department and kept in the police garage. With the cooperation of the police department, a stretcher is carried on the patrol car [which accompanies the ambulance] and a good many calls are made by the patrol and the patient transferred very comfortably. When the ambulance is out and a second emergency call comes, a doctor always accompanies the patrol" (4).

On January 1, 1925, the city-operated ambulance service was changed to a contract system with a "well-established and reliable firm,"

**Table 2. Cost to the city of emergency ambulance service, Seattle, Wash., 1953-58**

Year	Calls processed	Calls paid by city	Per cent	Cost per call	Total cost
1953....	3,784	2,400	63	\$7.00	\$16,800
1954....	3,943	2,342	59	8.00	18,096
1955....	4,437	2,698	61	8.00	18,990
1956....	4,719	3,049	65	8.00	24,396
1957....	4,903	2,892	59	8.00	23,000
1958....	4,939	2,698	55	10.00	26,976

**Table 3. Outcome of emergency ambulance calls, Seattle, Wash., 1956-58**

Disposition of patient	1956		1957		1958	
	Number	Percent	Number	Percent	Number	Percent
Jail.....	42	0.9	50	1	20	0.4
Private hospital.....	676	14	759	15	1,036	21
Sanatorium.....					1	
King County Hospital.....	3,688	78	3,690	75	3,497	71
Refused call <sup>1</sup> .....	34		42		27	
Other transportation <sup>1</sup> .....	12		31		7	
Unknown.....	267	6	330	7	351	7
Total.....	4,719		4,903		4,939	

<sup>1</sup> From 34 to 73 patients refused a city-dispatched ambulance or used other transportation, but in all these cases the city was still under agreement to pay for the call.

Shepard Ambulance Service, at a saving of about \$3,000 per year. The contract called for supplying emergency ambulances from a central and north-end location, and, in addition, an ambulance from 7 p.m. to 7 a.m. at the Public Safety Building. Interns at the City Emergency Hospital, opened in 1909, rode the vehicle until just before World War II when, because of extreme doctor shortage, it became necessary to staff the ambulances with orderlies. For this contract service, Seattle paid \$1,000 per month in 1944, and \$1,100 monthly in 1945.

The contract system with Shepard Ambulance Service ended in the summer of 1947. On July 1 of that year, three ambulance firms were engaged, to be reimbursed on a per call basis for uncollectible emergency runs. A Shepard ambulance continued to operate at night from the Public Safety Building.

The current system is essentially the same as the one established in 1947. The city neither owns nor operates any ambulances.

#### Method of Operation

The four independent, privately owned companies who supply the 20 ambulances which answer Seattle's emergency calls have established, by their own agreement, six zones within the city limits. Each company or branch office of a company handles emergency calls in one assigned zone. All emergency calls are channeled by two-way radio to a dispatcher, on duty 24 hours a day at City Emergency Hospital, now the jail infirmary since the opening of the King County Hospital in 1931. The dispatcher calls the appropriate company for the zone in which the accident occurs. If the company has no equipment available, the dis-

**Table 4. Frequency of calls for emergency ambulance service, in 3-hour intervals, Seattle, Wash., 1956-58**

Time of call	1956		1957		1958	
	Number	Percent	Number	Percent	Number	Percent
12 midnight-3 a.m.....	568	12	585	12	512	10
3 a.m.-6 a.m.....	210	5	227	5	222	5
6 a.m.-9 a.m.....	376	8	440	9	351	7
9 a.m.-12 noon.....	566	12	624	13	607	12
12 noon-3 p.m.....	694	15	796	16	786	16
3 p.m.-6 p.m.....	865	18	860	18	985	20
6 p.m.-9 p.m.....	797	17	741	15	846	17
9 p.m.-12 midnight.....	626	13	629	12	629	13
Unknown.....	17		1		1	
Total.....	4,719	100	4,903	100	4,939	100

patcher calls for an ambulance from a neighboring zone.

The police department is Seattle's main source of calls to the central dispatcher (table 1). All calls are accepted, however, with the exception of calls for service resulting from accidents and illness occurring in industrial establishments, for nonemergency service, and for patients, other than traffic casualties, who are recipients of public welfare. Industrial firms must make their own arrangements for emergency service. Nonemergency service is not considered a city responsibility and, in the same way, persons receiving public welfare are considered private cases since a request from a physician must be made to the welfare department before ambulance service can be authorized.

Although the city's contract with the companies supplying ambulance service does not contain specific regulations, certain rules governing the service have been agreed upon by the participants. They are:

1. The participating companies must maintain and keep in service at least two ambulances at all times.

2. The crew of an ambulance on call must consist of a driver and an assistant, one of whom must hold a Red Cross first aid certificate or other certificate of equal standing or have had enough actual experience to compensate for a certificate.

3. The following accessories shall be carried in each ambulance: invalid couch-type bed on wheels; stretcher for second patient on floor or

hanger; bandages, tourniquets, and splints; oxygen; and clean linen and blankets for two patients.

4. Communication procedures require that only company offices which maintain two-way radio dispatch service or the central dispatch office contact ambulance drivers. Under no circumstances may one company transfer calls to another; rerouting is to be handled exclusively by central dispatch. And all calls must be handled promptly.

5. Participating companies must carry insurance in the amounts of \$50,000 and \$100,000 for public liability and \$10,000 for property damage. The required insurance coverage must be certified in writing to the health department by the insurance carrier, who must also stipulate the amount of insurance coverage for each accident and each individual, and agree to notify the department immediately of policy cancellation or change.

6. Companies are to collect payment for calls within 90 days, and prevailing rates are to be charged. The city will reimburse the companies for unpaid-for calls at the end of the 90-day period. Rates to be charged the city are established by the health department each year. When two persons are carried, the company will be paid by the city for only one person. When collection is made from one person in instances where two persons were carried, the company shall not collect from the city for the second person.

7. Reasons for curtailing or discontinuing the services of an ambulance company are: re-

**Table 5. Age of patients to whom emergency ambulance service was given, Seattle, Wash., 1956-58**

Age (years)	1956		1957		1958	
	Number	Percent	Number	Percent	Number	Percent
0-5.....	89	2	104	2	101	2
6-10.....	127	3	100	2	105	2
11-20.....	312	7	286	6	309	6
21-30.....	560	12	493	10	404	8
31-40.....	502	11	521	10	511	11
41-50.....	588	12	534	11	515	12
51-60.....	593	12	619	13	605	12
61-70.....	331	7	377	8	315	6
Over 70.....	252	5	245	5	227	5
Unknown.....	1,365	29	1,624	33	1,847	37
Total.....	4,719	100	4,903	100	4,939	100

**Table 6. Causes given for emergency ambulance service in Seattle, Wash., 1956-58**

Causes	1956		1957		1958	
	Number	Percent	Number	Percent	Number	Percent
Diabetes.....	60	1	56	1	63	1
Nervous diseases.....	559	11	533	10	528	10
Heart conditions.....	338	7	384	7	311	6
Respiratory diseases.....	2	-----	1	-----	3	-----
Digestive diseases.....	12	-----	2	-----	7	-----
Birth.....	60	1	51	1	54	1
Alcoholism.....	497	10	370	7	536	11
Causes unknown.....	1, 244	25	1, 448	28	1, 296	25
Traffic accidents.....	1, 390	28	1, 607	30	1, 615	32
Poison, drugs, foodstuffs, utility gas.....	82	2	57	1	66	1
Accidental falls.....	383	8	368	7	367	2
Other accidents.....	102	2	96	2	91	7
Mechanical suffocation.....	6	-----	4	-----	5	-----
Drowning and submersion.....	2	-----	5	-----	7	-----
Suicide.....	136	3	136	3	129	2
Homicide.....	124	2	137	3	126	2
Total.....	4, 997	100	5, 255	100	5, 231	100

NOTE: For some patients more than one condition was reported.

ceiving and answering calls from other than regular channels; tuning in on police calls; poor condition of ambulance, equipment, and supplies; failure to supply trained crew; unnecessary delay in answering calls; and failure to carry and keep in force proper amount of insurance.

8. Rulings of the director of public health shall be final.

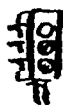
Table 2 shows the number of emergency ambulance requests since 1953 and the number of calls paid for by the city. The city bears the expense of between 59 and 65 percent of all emergency calls dispatched by the City Emergency Hospital. The cost in 1958 was \$26,976.

The cost of the present program, however, is less expensive than a city owned and operated service would be. A new Cadillac Superior ambulance costs about \$10,000, f.o.b. factory, and to equip the city with a fleet comparable to the one now available would cost about \$200,000. Maintenance expense and salaries for drivers and attendants would swell this amount. With the present system, the city cooperates with private enterprise instead of competing with it, has satisfactory ambulance service at relatively low cost, and is supplied with a combined fleet of 20 vehicles at strategic locations.

In the past 3 years, approximately 75 percent of all emergency calls were routed to King

County Hospital, with less than 21 percent going to private institutions (table 3).

Table 4 shows the frequency of calls at 3-hour intervals round-the-clock. Tables 5 and 6 reveal the ages of patients and the reasons given for requiring ambulance service.



## Traffic Demands

A MAJOR ISSUE in supplying any city with emergency transportation for ill or injured patients is the need for sirens and flashing red lights to permit ambulances the right-of-way. Speed beyond posted limits is another facet of the same issue. Both medical and non-medical agencies are concerned.

In Seattle, the law is clear regarding attainment of the right-of-way. Both the ordinances of the city and the laws of the State of Washington demand that ambulances and other emergency vehicles give "audible signal by siren, exhaust whistle, or bell."

Proponents of noise abatement believe that the reduction or elimination of the use of the ambulance siren will aid in the achievement of their ultimate objective. Two courses of action may be taken to accomplish this purpose: repeal of existing laws which give ambulances the



opportunity to gain the right-of-way; or imposition of strict limitations on ambulance movement, listing certain situations in which the right-of-way should be granted. Consideration must be given to the exercise of sound medical judgment by a well-trained medical person in the second course mentioned, a person with more training than the average ambulance attendant.

In order to gain the right-of-way, a certain amount of noise must be created. The earliest ordinance prohibiting unnecessary noise was enacted in Stamford, Conn., in 1926, but sections of city ordinances have dealt with the subject since 1891 (5). In a 1930 study by the New York Noise Abatement Council, fire, police, and ambulance sirens constituted 4.12 percent of 11,068 complaints of noise in a city with a network of elevated, subway, and trolley cars.

It has also been mentioned that ambulance sirens and the warning devices of the police and fire departments may be confused with a civil defense alert. In 1950, New York City ambulance sirens were removed specifically for this reason, but a year later the order was rescinded.

Many people believe that, in addition to creating undesirable noise by the use of sirens, the right-of-way privilege given to emergency ambulances increases accidents at intersections. In Seattle, permission is given to ambulances to disregard stop signs and traffic signals if they give the "audible signal" specified in State and local laws.

Although the total number is not available, the Seattle police department has records of seven injuries and six instances of property damage from traffic accidents involving ambulances in 1958. In 1957, there were five injuries and nine instances of property damage. The four participating ambulance companies report a collective total of nine traffic accidents in the past 3 years. None of these was fatal. It is reported that six of the accidents occurred at an intersection while the ambulance was operating with siren and red lights. Two operators said that the accidents were the result of "too little siren" and could have been avoided if the siren had been blown louder.

A study was undertaken in New York City to prove that revoking right-of-way privileges

would reduce traffic accidents involving ambulances (6). In 1949-50, there was 1 accident in every 972 calls when sirens were in use and ambulance drivers were permitted to ignore traffic regulations. When sirens were removed in 1950-51 due to possible confusion with civil defense air raid signals, the ratio climbed to 1 accident in 715 calls, with the drivers still being permitted to ignore traffic regulations. In May 1953, the order was rescinded, sirens were restored, and right-of-way privileges remained in force. From June through September of that year, the ratio rose to 1 accident in 690 calls. The study began in October and continued through December 1953, a period of 3 months during which time all ambulances in the city adhered to traffic regulations and operated without sirens. Accidents declined 52 percent, or to 1 in 1,460 calls. During 1953-54, there was a further decline to 1 accident in 2,380 calls. Allegedly, denial of right-of-way privileges did not decrease the efficiency of emergency ambulance service in New York City.

In Seattle, the four operating ambulance companies are aware of the controversy on right-of-way privileges. Sirens are used in answering a call only when specified by the physician or city dispatcher. In transporting a patient to the hospital, use of red lights and siren is directed by the police, the attending physician, or, lacking these, by the ambulance attendant. The companies state that right-of-way is refused unless a siren and red lights are used and, without right-of-way privileges, a delay of from 30 to 60 minutes may result. In a peak-hour traffic situation, the delay may be even longer.

Seattle's experience with the "speeding ambulance" is limited. Three of the four operating companies require police escort before operators may exceed city speed limits. These companies believe the extra speed is not necessary if the ambulances are allowed free passage along thoroughfares and are given right-of-way through traffic signals and intersections.

#### City Ordinances

In replying to a questionnaire on emergency ambulance service prepared by the Seattle

health department in July 1958 and distributed to 113 cities in the United States and western Canada with an estimated population of over 100,000, 30 cities supplied copies of local ordinances governing ambulance operation. These ordinances primarily govern the licensing and control of ambulance operators, but it is apparent that many traffic regulations are applied in an attempt to reduce accidents involving ambulances on call.

No statistically accurate or valid appraisal of traffic laws regulating emergency ambulance service is possible from an evaluation of only 30 local ordinances. But it was noted that some cities had no restrictions on speed of operation while others limited ambulances to a speed 10 miles per hour over the posted limits.

Kansas City, Mo., conducted a study in 1954 of traffic regulations governing ambulances in 54 cities, located in 29 States. From 52 of the 54 cities, it was learned that 26 required ambulances to observe the same speed limits as other passenger vehicles. Thirteen cities required a speed consistent with safety, five specified no speed limit, and three limited ambulances to a maximum speed of 40 miles per hour. Forty of 49 cities did not permit ambulances to run red lights and stop signs, 16 allowed them to ignore such regulations in an emergency. Twelve cities allowed the right-of-way privilege if an audible warning or red lights were used, 10 if the vehicles slowed down at intersections, and 9 if the ambulance was operated "under safety conditions" (7).

It has been noted by one observer that an ambulance traveling 30 miles per hour takes 10 minutes to go 5 miles, yet to arrive at its destination 5 minutes earlier the vehicle would have to travel at double this speed or 60 miles per hour over the same course. A study conducted by Curry at Hurley Hospital, Flint, Mich., of 2,500 consecutive ambulance runs failed to show that 5 minutes would have influenced the course of a single injury (8). It was found that haste was unnecessary in 98.2 percent of the cases: they could have been transported according to traffic regulations. In 1.8 percent, expeditious handling was necessary, but the speeding ambulance could have increased injuries. In only one case was haste necessary to save life. Curry concluded that

ambulances should observe local speed laws, should use sirens, and should have the right-of-way.

Young, in his 238-page book entitled "Transportation of the Injured," states, in a chapter on ambulance safety, that "certainly the siren as an emergency warning device is here to stay. Additional accidents and perhaps even fatal delay could result in urgent cases without such a device. But indiscriminate use of a siren should be avoided, and, even when using it, adherence to normal traffic regulations is the safest policy" (9). Young further states, "From the medical standpoint, there are few emergencies that require speeding to a hospital if first aid is properly rendered on-the-spot."



## Driver Training

THE AMBULANCE driver and attendant are initially responsible for the care of casualties. It is important, therefore, that their training be commensurate with their responsibility.

With the limited resource of a first aid certificate or its equivalent in experience, Seattle crews are called upon to care for the patient at the accident scene and en route to the hospital. And the driver may be called upon to decide the speed he will use, either a slow cautious trip at the imposed speed limits and obeying traffic signals, a journey within the speed limits but using the siren and red lights, or a trip of maximum swiftness making full use of privileges of right-of-way and right to exceed the speed limit.

After interviews, it has been suggested that ambulance drivers and attendants in Seattle are not sufficiently trained to make such decisions and prefer to be directed by physicians or police officers. But it is readily apparent that policemen are no better prepared to judge such situations than ambulance crews.

More advanced training of ambulance attendants has been advocated by many officials. Perhaps the most vocal in expressing this view is Dr. George J. Curry, chairman of both the Subcommittee on Transportation of the In-

jured and the Subcommittee for Regional Committees on Trauma of the American College of Surgeons. Curry has published several provocative papers on the emergency care of the injured (8, 10-14) and in each, he has stressed the need for thorough and continual education of ambulance attendants.

An educational program was begun in Flint, Mich., in 1949, with the American College of Surgeons arranging a series of lectures and demonstrations. Expeditions and standardized handling of common injuries was discussed. The educational program was motivated by amendment of local ordinances governing the qualifications of ambulance attendants and regulating equipment to be used in first aid treatment, providing penalties for violations. Ambulance attendants participating in the program were each awarded a certificate of fitness which required renewal annually (8).

A general community plan for action by Curry suggests:

1. Adoption of a city ordinance requiring certificates of proficiency for ambulance attendants.

2. Educational programs for ambulance attendants under the sponsorship of the county medical society, the Regional Committee on Trauma of the American College of Surgeons, or the hospital staff organizations. Such programs can be arranged either directly by the sponsoring groups or through the Red Cross under the sponsorship of specialized organizations. Instruction can be given by physicians in training as residents in local hospitals. In communities lacking hospital house staffs or a hospital, young physicians in the area could serve.

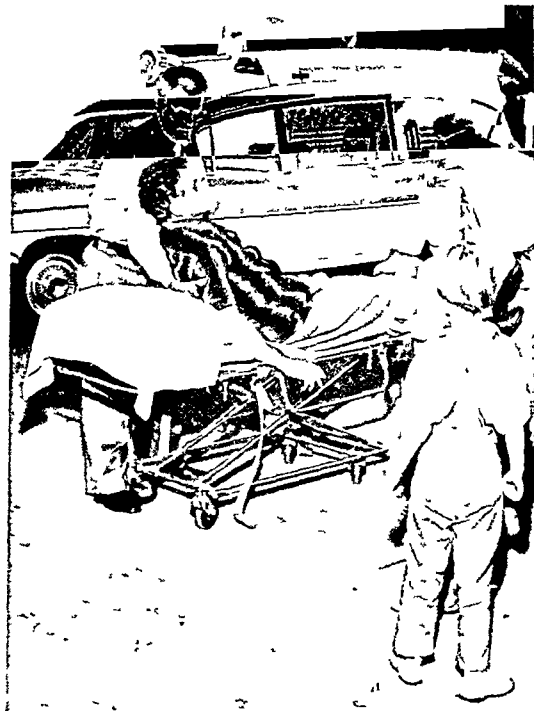
3. A receiving department chart of cases, recording the quality of transportation.

4. Biannual inspection of all ambulance equipment.

5. A well-organized emergency receiving department and efficient organization of hospital care.

6. Delegation of the entire problem to willing workers.

Young devoted one-half of his book, "Transportation of the Injured," to first aid and the ambulance attendant (9). Young believes that the duties of the dispatcher are by no means



unimportant, saying "all calls for an emergency ambulance are urgent until proven otherwise. The urgency of the request should be ascertained by the dispatcher, who should always find out as much as possible about the emergency before sending the ambulance. Those assigned to dispatch emergency ambulances should have first aid training; they can then give essential, lifesaving information to the caller. This practice is soundly recommended. In addition, the dispatcher should ask that someone be available at the scene to assist in locating the injured person quickly."

Seattle's medical community has taken a keen interest in its emergency ambulance program, particularly in speeding and the use of sirens. Dr. Quin B. DeMarsh, president of the King County Medical Society, is currently a member of a surveillance committee studying safety and use of sirens in gaining right-of-way in traffic in the city and other municipalities of 100,000 population. Spontaneous interest by physicians has been augmented by inquiries from the Regional Committee on Trauma of the American College of Surgeons and by community efforts in traffic safety such as the Seattle-King County Safety Council.

DeMarsh has suggested that if the solution

for excessive speed and indiscriminate use of sirens is not found through legal curtailment, an intensive educational program for ambulance drivers and attendants may be the answer. It is apparent that regular surveillance of emergency calls should be accomplished in this community, if the present ambulance system is continued. Both educational and disciplinary measures may be needed to correct the abuses reported in specific cases. Public authorities should take an active role in correcting irregular practices.

## Summary

Emergency ambulance service in Seattle has progressed since 1892 from one wagon to a fleet of 20 well-equipped ambulances supplied by four privately owned companies. The city contracts for this service, agreeing to pay for each call remaining unpaid 90 days after the emergency.

The Seattle-King County Department of Health surveyed ambulance service in Seattle in 1953 and in 113 cities in the United States and western Canada with a population of 100,000 in 1958. The current system of operation was influenced by these survey findings.

Analyses of emergency calls in Seattle by source, cost, disposition, time, age of patients, and cause of emergency indicate that police report most casualties; costs per call and total costs have risen with population growth; the majority of all patients are taken to a hospital; the most frequent hours for emergencies are from 3 p.m. to 6 p.m.; persons between 51 and 60 years of age use ambulance service the most; and either traffic accidents or unknown causes are given as the reason in about one-third of the emergencies.

Traffic regulation of ambulances in emergencies is controversial. State and local laws require use of an audible signal to gain right-of-way privileges in Seattle. Studies on speed and noise abatement in other localities have established that speed of delivery of the patient to the hospital rarely has important implications in recovery. Adherence to normal traffic

regulations is advocated by some authorities. Emergency ambulances in New York City, operating without sirens and obeying all traffic regulations, reduced accidents involving these vehicles 52 per cent during a 3-month period in 1953-54.

Advance training of ambulance drivers is presented as a possible solution to problems of ambulance operation. It is suggested that education under the guidance of experienced physicians and other professional personnel in the community will promote the exercise of better judgment by ambulance attendants.

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## *Malaria and Opium Control in Iran*

**A** GLANCE at two major health developments in Iran, achieved in little more than a decade, illustrates the dramatic contributions health workers have made to the well-being of a people.

Iran is one of the many countries with shortages of transportation, communication, industry, equipment, trained personnel, and administrative organization to overcome in its coordinated development. In addition, until 1950, malaria and opium addiction prevented a large proportion of its population from functioning effectively.

### **Malaria**

Despite the lack of national statistics, one could see that large numbers of workers were

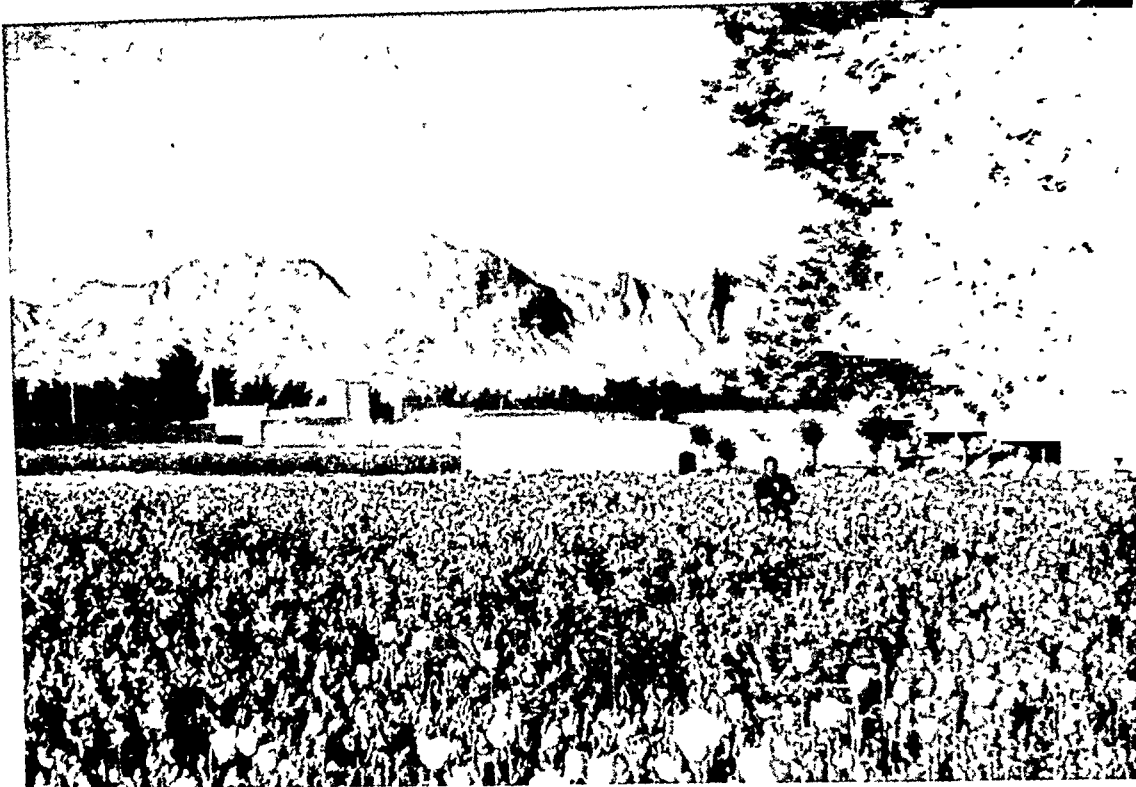
suffering attacks of malaria during the growing season. For example, along the Caspian Sea in the north adequate rainfall should have made the land particularly productive. But throughout history malaria had caused it to be known as the "poisonous region."

DDT spraying commenced in 1947 with the first demonstration programs supported by the Near East Foundation and the United Nations. They showed that the transmission of malaria could be controlled rapidly by spraying the insecticide on the walls where *Anopheles* mosquitoes, engorged with malarious blood, rested.

In 1950 the Iranian Seven Year Plan Organization began a national program of malaria control. The U.S. Technical Cooperation Administration (now the U.S. Operations



A malaria control team from the Iranian Ministry of Health crosses a footbridge near the Caspian Sea. The U.S. International Cooperation Administration supplied sprayers and DDT for such teams.



Fields of opium poppies, once conspicuous near every village in central and southern Iran, had disappeared by 1956. Strictly enforced laws forbid cultivation of the plant.

Mission, International Cooperation Administration) contributed insecticide, technical guidance, and administrative support. The World Health Organization supplied malarialogists, entomologists, and technical grants to further scientific guidance. Despite difficulties brought on by the oil crisis and the political pressures of the once strong Tudeh (Communist) Party, the antimalaria work continued to expand. The campaign has been described in detail (E. E. Palmquist and F. F. Aldridge: *Malaria control in Iran*. Pub. Health Rep. 69: 976-981, October 1954).

The progress against malaria can be gauged. In the Caspian area the spleen indexes of village children have dropped from 95 to an irreducible 2 percent. Formerly, every clinic there saw hundreds of cases each year; now only sporadic cases are confirmed.

Throughout much of the plateau which comprises most of the country, malarimetric indexes have fallen dramatically. Malaria still exists in Iran, especially in the southern part of the Iranian plateau. But antimalaria cam-

paign workers are concentrating on eliminating the residual reservoir so that the disease can be eradicated in Iran. The work is now supported predominantly by income from Iranian oil and is being administered entirely by Iranians.

### Opium

To the casual observer, the most obvious indication of the importance of opium in Iran was the large amount of precious agricultural land devoted to the opium poppy. Of course, not all of this easily transportable product was used in Iran, but it is safe to assume that only a small fraction was turned to legitimate medical uses.

The number of addicts was not known, but it was apparent that the narcotic was in fairly common use. While it is true that the surroundings appear less harsh under the influence of opium, the loss of vitality and strength, diminished sense of responsibility, the general inertia, and the expense generally overshadow any benefits conceivable to users. They become dulled and wasted.

By 1956, the opium poppy, previously grown near every village in central and southern Iran, had disappeared. Effective legislation forbidding its cultivation had been hammered through. With the firm support of the Shah and some exemplary penalties, the law has been strictly enforced.

Iran has accomplished a great deal through its own efforts to combat addiction. The public health education division of the Public Health Cooperative Organization (a former administrative pooling of Iranian and United States funds, equipment, supplies, and technicians) contributed to widespread education and publicity through talks, posters, and other information media. Medical, narcotics, and laboratory advisers from ICA and WHO worked with Iran's limited treatment facilities to ease the turmoil which follows suppression of the availability and use of the drug. Drugs to be used temporarily during withdrawal were supplied. An ICA hospital administration consultant helped to expand and reorganize hospital facilities to care for those severely affected by withdrawal.

Enforcement officers for antinarcotics work were trained in a school started with the help of ICA, and scientists, under UN grants, were trained abroad in laboratory techniques for detecting usage. Contact with neighboring countries on the narcotics problem has been fostered by the UN and the CENTO Pact. Agricultural advisers of ICA and the Food and Agriculture Organization helped to supply new crops to fill the gap created by suppression of cultivation and marketing of the product.

The cost of opium has increased to 40 times its 1956 price, out of reach of most users, and the

number of users has been reduced by at least two-thirds. Villagers, dulled for decades, have given up opium and turned to the production of crops and flocks badly needed to support the development of the nation. The effect of Iran's achievement on the international traffic in illicit drugs alone deserves worldwide interest, assistance, and cooperation.

### Other Changes

International teamwork has led to other achievements in Iran. To mention a few—the newly emphasized concept of preventing disease has resulted in 12 million vaccinations; typhus outbreaks have been cut short by DDT dusting; women are experiencing a challenging liberation as nursing becomes a respected and useful profession; a widespread health education program is reaching the people; basic public health laboratory methods are being adopted; the largest city in the world without a sanitary water distribution system now has one; and rural sanitation workers are being trained to work on the environmental factors important to the villagers' health.

In these achievements no one worked alone, everyone worked together toward similar goals. Iranians worked with the Near East Foundation, ICA, WHO, UNICEF, Rockefeller Foundation, and others inside and outside the country. Together they formed a team which caused a country to change for the better.

—FRANZ W. ROSA, M.D., M.P.H., *now in Lahore with the U.S. Operations Mission to Pakistan, was formerly public health physician with the U.S. Operations Mission to Iran.*

# Control of Staphylococcal Food Poisoning

BENJAMIN E. HODGE, M.D.

**S**TAPHYLOCOCCAL food poisoning is overwhelmingly the most prevalent of food-borne infections in the United States. The need for improved methods of controlling the disease is indicated by the number of outbreaks reported in the annual summaries of disease outbreaks, which show little evidence of decrease in incidence (1-4).

Factors responsible for outbreaks of staphylococcal food poisoning have not been clearly defined. It is difficult, if not impossible, to determine those conditions required to render food poisonous because no satisfactory laboratory test has been found for the presence of staphylococcus enterotoxin in food (5-7). At present, the only means of clarifying these factors appears to be through analysis of unselected outbreaks of this disease.

Ninety-five outbreaks of staphylococcal food poisoning in 1955 and 1956, reported in the weekly communicable disease summaries issued by the Public Health Service, were surveyed. More complete data on 89 of them were obtained from the State, county, and city health officers reporting the incidents.

## Analysis of Outbreaks

The diagnosis of staphylococcal food poisoning is generally based on circumstantial evidence, not on demonstrated presence of enterotoxin in food. In this series the diagnosis was based on opinions of health officers originally

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*Dr. Hodge, who died November 28, 1958, was medical supervisor of the general services department of E. I. du Pont de Nemours & Co., Wilmington, Del., and for several years served on the medical staff of the Johns Hopkins Hospital, Baltimore.*

reporting the outbreaks and on the finding of staphylococci in food. Since staphylococci are ubiquitous and many strains are not enterotoxigenic, the mere presence of staphylococci in food is not sound evidence for the diagnosis of this disease. However, in this survey, the diagnosis of staphylococcal food poisoning was supported by two types of supplementary evidence: the type of staphylococcus found in the incriminated food and the incubation periods of the outbreaks.

In the 75 outbreaks which reported such information, the organisms considered to be staphylococci were classified as follows:

Classification	Number of outbreaks
Coagulase positive.....	53
Coagulase negative.....	5
<i>Staphylococcus aureus</i> .....	45
<i>Staphylococcus albus</i> .....	1
Hemolytic .....	28

Thus, of 75 outbreaks, 71 percent of the staphylococci were coagulase positive; 60 percent, *aureus*; and 37 percent were hemolytic. Phage typing and bacterial counts were each reported in three instances, and kitten test for presence of enterotoxin once—too seldom to be of significance. These data indicate, but do not prove, that the organisms generally found were enterotoxigenic.

The incubation periods were recorded in 77 outbreaks.

Incubation period	Number of outbreaks	Percent of outbreaks
1-4 hours.....	61	79.2
5-8 hours.....	11	14.3
More than 8 hours.....	5	6.5

The incubation periods in this series agree with those accepted for this disease. In Feig's series (8), the incubation periods in 50.5 percent of the outbreaks of staphylococcal food



poisoning were less than 4 hours and in 86 per cent were less than 8 hours. Comparison of incubation periods of staphylococcal food poisoning with those of other common foodborne diseases shows the importance of this particular item. Feig reported the median incubation period of salmonellosis as 19.9 hours and of dysentery as 53.4 hours, and Dack (9) reported the incubation period of botulism as 12 hours to many days. Consequently, it appears that the outbreaks surveyed were classified as staphylococcal food poisoning with reasonable accuracy.

### Factors Responsible

Dack showed that staphylococcal food poisoning may result after ingestion of certain foods which had been contaminated by enterotoxigenic staphylococci and had remained at proper temperatures long enough to produce dangerous amounts of enterotoxin. Overt infections of food handlers and uncleanness have been commonly assumed to be the sources of contamination of food, although no general survey has been reported to determine the overall significance of such infections or unclean practices. Furthermore, types of food capable of acting as vehicles of this disease and methods of handling food permitting formation of dangerous amounts of enterotoxin have not been clearly defined.

### *Types of Food Acting as Vehicles*

In 94 out of 95 outbreaks, the vehicle of this disease was reported as cooked food, which contained large proportions of protein. This is in agreement with other observations. In 63 outbreaks, or 67 percent, the vehicles were food mixtures such as tuna salad, turkey salad, creamed chicken, potato salad, meat loaf, chicken pie, egg salad, and cream-filled pastries. Such mixtures are usually handled extensively after cooking.

Raw and freshly cooked meats were not reported in this series and cannot be found recorded in the literature as the vehicle of staphylococcal food poisoning, regardless of state of preservation of meat prior to cooking. The fact that many people throughout the world consume putrid meat with impunity indicates

that raw foods probably are incapable of acting as vehicles of this disease. Unfortunately, no experiments have been reported to substantiate or deny this thesis.

Vegetables, unmixed with high-protein foods, were not reported as the vehicle in any outbreak in this series. Careful differentiation should be made between vegetables mixed with high-protein foods, such as potato salad containing eggs or mashed potatoes prepared with milk and eggs, and vegetables unmixed with any high-protein items.

### *Food Handlers' Infections and Uncleanness*

Specific questionnaires were sent to all health officers originally reporting outbreaks to determine whether (a) food handlers were examined in connection with the outbreaks, (b) any infection of food handlers was found, (c) the utensils and premises were inspected, and (d) any unclean practices were discovered.

Visible infections of food handlers were reported in only nine outbreaks and were listed as "some lesions on hands of one food handler," "burn from bleach," "infection of eyelid," "blister on hand," "cuts on hand," "two bakers had chronic paronychia," "skin lesions," "healing lesion on hand," and "one cook had eczema." Thus, infections of food handlers, including questionable ones, were not commonly reported in association with outbreaks of staphylococcal food poisoning.

Insanitary practices were reported in only 13 outbreaks. In four outbreaks the practices were described as "unclean" without details given. Other descriptions were "roaches, flies, and unclean premises and equipment," "dirty refrigerator," "debris on slicing machine," "not adequately sanitized," "sanitation poor in pastry shop," "utensils dirty, garbage storage poor," "custard gun eroded," "careless," and "terrible."

Abnormal environmental conditions, including both infections of food handlers and uncleanness, were reported in a total of 21 outbreaks—1 outbreak reporting both uncleanness and infection of food handler. In 50 outbreaks, examinations of food handlers and inspections of premises revealed neither infections of food handlers nor uncleanness. In 24 additional outbreaks, there was no record of

either infection or uncleanness, but reports on this group should be discounted since the data were not complete. Thus, of 71 outbreaks reporting complete information, in 70 percent no obvious environmental conditions which could act as a source of contamination of food by staphylococci were observed.

### *Methods of Handling Food*

The manner of handling vehicles of these outbreaks was investigated through the following questions sent to various health officers. Was the vehicle of food poisoning inadequately refrigerated after cooking, and, if so, under what conditions and how long? Was the vehicle inadequately heated after cooking? If so, under what conditions and how long? Was the food left over or cooked the day before it was consumed?

Leftover food was reported as the vehicle of 81 outbreaks. In only five outbreaks was the vehicle food cooked on the day of consumption. No information was available in nine outbreaks. Thus, leftover food was the reported vehicle of this disease in 94 percent of 86 outbreaks reporting this information.

Unrefrigerated food was reported as the vehicle in 74 of 83 outbreaks supplying information on manner of handling food after cooking. The minimal length of time and temperature of keeping food unrefrigerated are of great importance in defining the rate of enterotoxin production resulting in food poisoning. The length of time food was kept unrefrigerated was tabulated.

<i>Time period</i>	<i>Number of outbreaks</i>
Less than 4 hours-----	6
4-8 hours-----	8
More than 8 hours-----	35
Unknown-----	25

From these data it appears that food can be rendered poisonous within 4 hours. However, careful scrutiny of the six outbreaks in which food was reported unrefrigerated for less than 4 hours shows that two of them involved cream-filled pastries. Here adequate chilling of the custard filling was evidently delayed long after being placed in the refrigerator because of insulation of the pastry capsule. In two other outbreaks food was alternately warmed and in-

adequately chilled. The two remaining instances both involved potato salad, which may have been unchilled for less than 4 hours. The author witnessed one outbreak in which potato salad containing eggs was prepared after 8 a.m. and consumed at 11:30 a.m.; six cases of staphylococcal food poisoning resulted. These cases indicate that unrefrigerated, cooked protein food may become poisonous within 4 hours, but that a period of 8 hours or longer is more common.

No precise information regarding the temperatures which permitted food to become poisonous could be obtained by examination of the circumstances of keeping the vehicles. Temperatures were recorded predominantly as "room temperature."

In 13 outbreaks, cooked protein food was reported inadequately heated. The circumstances appear to have been nearly ideal for bacterial growth: in five instances food was kept on a warm steamtable; and in one instance each in defective oven, in warming oven, under burnt-out infrared lamps, on warming table, and in oven with pilot light burning. The specific circumstances were not mentioned in three instances.

In four outbreaks the food was constantly refrigerated after cooking. Two of these outbreaks involved Boston cream pie and chocolate eclairs, in which encasing pastry acts as efficient insulation. We have found that 3 hours or more are required to lower the temperature of custard within eclairs from 80° to 50° F. when refrigerated constantly at 38° to 42° F. Thus, custard-filled pastries reported constantly refrigerated are, in fact, not chilled for a period of some hours. In the third outbreak the vehicle had been refrigerated in a thick mass in large containers, while the fourth outbreak involved tuna salad prepared with leftover deviled eggs. It seems likely that the vehicle in each of these four outbreaks was not promptly, constantly, and adequately chilled.

Table 1 summarizes the results of this survey. The vehicle in 99 percent of the outbreaks was cooked food which contained large proportions of protein, strong evidence that other types of food such as raw food, vegetables, and other low-protein foods are incapable of acting as vehicles of this disease. Since 70 percent of 71

outbreaks were free from obvious infections of food handlers and without unclean practices, it appears sound to conclude that such abnormal environmental conditions are not the prevailing factors determining the development of this disease. On the other hand, in 83 outbreaks reported on fully, the vehicle was high-protein food, unrefrigerated after cooking in 74 instances, kept warm after cooking in 13 instances, and in 8 instances the food was alternately warmed and left unrefrigerated. Therefore, in 79 out of 83 outbreaks the vehicle was unrefrigerated or warmed after cooking, or both. These numbers clearly show that the determining factor in the development of staphylococcal food poisoning lies in permitting cooked protein food to remain warm or at room temperature for periods of 4 hours or longer.

### Discussion

Outbreaks of staphylococcal food poisoning have been generally considered to be dependent on two major factors: (a) some abnormal source of contamination of food by enterotoxigenic staphylococci, such as infections of food handlers; and (b) keeping food under conditions that permit dangerous amounts of enterotoxin to form. In view of the relative infre-

quency of abnormal environmental conditions, it seems clear that food may be commonly contaminated by enterotoxigenic staphylococci under apparently normal, sanitary conditions.

Actually, a large percentage of normal persons have been shown to be carriers of pathogenic staphylococci. Getting and associates (10) reported that 18 percent of 122 food handlers who were apparently free of any infections but who were associated with 10 outbreaks of staphylococcal food poisoning were carriers of strains of staphylococci apparently identical with those strains found in the incriminated food. Allison (5) reported 33 percent of healthy persons as carriers of coagulase positive strains of staphylococci in the gastrointestinal tract. Blair (11) states, "Potentially pathogenic forms [of staphylococci] are constantly carried on the skin or in the nose by approximately 20 and 50 percent, respectively, of all individuals." In view of the large percentage of healthy persons who carry pathogenic staphylococci, it seems logical to assume that virtually all food may become contaminated by these organisms, regardless of the state of cleanliness and the presence or absence of infections in food handlers.

In this series of outbreaks there is sound evidence that staphylococcal food poisoning occurs only when cooked protein food remains for some time at approximately room temperature. None of the outbreaks involved consumption of freshly cooked food. These facts are not new, except in one respect. They indicate that this disease develops when protein food is neglected after cooking rather than because of a multitude of factors. They show that immaculate cleanliness and freedom from infection will not prevent outbreaks of staphylococcal food poisoning.

### Prevention

All recommendations for the control of this disease have one objective: to prevent the staphylococci present in cooked protein food from forming enterotoxin. Attempts to keep food uncontaminated with staphylococci by cleanliness and isolation of food handlers appear doomed to failure because of the widespread presence of the organism. Consequently,

**Table 1. Summary of responsible factors in 95 outbreaks of staphylococcal food poisoning in the United States, 1955-56**

Factors	Outbreaks		Number of outbreaks reporting this type of data
	Number	Percent	
Types of food:			
Cooked high-protein	94	99	95
Leftover	81	94	86
Food mixtures	63	67	95
Fresh cooked meat	0		95
Raw meat	0		95
Vegetables only	0		95
Environment:			
Satisfactory	50	70	71
Uncleanliness	13	18	71
Infections of handlers	9	13	71
Method of handling food after cooking:			
Unrefrigerated or warmed, or both	79	95	83
Unrefrigerated	74	89	83
Warmed	13	16	83

effective points of attack lie in keeping cooked protein food at such temperatures that staphylococci cannot form enterotoxin, and limiting the length of time cooked protein food is kept at dangerous temperatures.

Segalove and Dack (12) reported the length of time and temperature necessary to produce enterotoxin in the laboratory. However, they state that much greater time is required to produce enterotoxin under laboratory conditions than is reportedly required to render food poisonous. Thus, their experiments are not strictly applicable for the control of this disease. In the absence of precise knowledge, these standards of temperatures and limits of time which may safeguard food have been chosen arbitrarily:

1. 40° F. is the maximum temperature for keeping cold, cooked protein food; 50° F. has been recommended but Evans and Niven (13) found that enterotoxigenic staphylococci grow well at this temperature. Segalove and Dack (12) showed that the rate of enterotoxin production was progressively retarded with lowering the temperature below 98.6° F. Since modern refrigerators may be adjusted with ease to temperatures of 40° F. and lower, this level appears advisable.

2. 140° F. is the minimum temperature for keeping hot cooked food since this is the reported thermal death point of staphylococci (11).

3. Three hours is the maximum length of time cooked protein food should be kept between 40° and 140° F., including the time required for chilling. This means the total cumulative time that food remains in this temperature range. The length of each exposure to temperatures 40°-140° F. must be added to that of all previous exposures when leftover food is involved.

While these recommendations are simple in principle, they are difficult in practice. Miller and Smull (14) reported that the quickest chilling of 1-gallon lots of potato salad requires 3 hours after being placed on beds of ice. Lewis and associates (15) recommended chilling food in shallow, flat pans rather than in deep containers; and Black and Lewis (16) recommended refrigerating food while hot.

In the author's experience, the most rapid way of chilling food is to place it in flat, stainless steel pans in a freezing compartment rather than in the refrigerator. For example, it was found that the internal temperature of ½-gallon lots of potato salad was lowered from 65° to 41° F. within 35 minutes after being placed in the freezer at 14° F., while it required 80 minutes to lower the temperature of control lots from 65° to 46° F. after being placed in the refrigerator at 40°-44° F. Utilization of the freezing compartment of refrigerators appears the most effective way yet found to hurdle a major problem in controlling this disease—the delay in chilling cooked food.

In contrast to the difficulty in chilling food, rapid heating is relatively simple because of the large heat differential. In this survey and in the author's experience, inadequate heating of food usually arises from gross negligence—placing food in warm ovens; keeping food on a steamtable for many hours after the heat has been turned off; lowering the temperature of the steamtable because workers find its heat objectionable; mixing hot and cold items without subsequent heating, such as mixing cold chicken with hot cream sauce; warming leftover food rather than heating it thoroughly; and judging temperature of food by temperature of the water bath. In one instance the temperature of the water bath was 160° F., while that of the mass of food was 90° F.

There is often great discrepancy between the temperature of food and temperature of its environment, whether the environment be a water bath or refrigerator. Furthermore, the rate of chilling or heating food cannot be predetermined by sizes or types of containers or by mass of food, since the varied consistencies of food result in varied rates of heat conduction. Consequently, the only means of determining that food is adequately chilled is to insert a thermometer into the mass of food.

Certain problem foods should be handled with special precaution. If custard-filled puffs or eclairs are not to be consumed immediately after preparation, Stritar and associates (17) recommend rebaking them at 375° F. for 30 minutes, which these authors found sterilized the custard within the shell. Potato salad,

chicken salad, egg salad, and similar items should not be used as leftovers since the 3-hour safe-time limit is usually consumed in preparing and serving. Foods containing bread or cracker crumbs, such as croquettes, meat loaf, and poultry dressing, pose a problem because the crumbs create air pockets and act as insulation against heating. Such foods should be prepared only for immediate consumption unless the temperature of the interior of the food has risen to more than 150° F. in cooking.

Sandwiches are common vehicles of staphylococcal food poisoning because they are frequently prepared well in advance of consumption and because chilling the filling of the sandwich, the crucial step, is impeded by the encasing bread acting as insulation. When sandwiches are not to be consumed immediately after preparation, the author suggests chilling them by placing them in layers of two in the freezer. Observations, reported in table 2, show that the filling of sandwiches cannot be adequately chilled when the sandwiches are stacked in three layers, even in freezers, but can be adequately chilled in 2 hours when sandwiches are stacked in two layers in a freezer.

**Table 2. Rate of chilling ham filling in sandwiches refrigerated under various conditions**

Temperature of refrigerator or freezer (degrees Fahrenheit)	Number of layers of sandwiches	Length of time (hours)	Fall of temperatures of ham filling <sup>1</sup> (degrees Fahrenheit)
38-40-----	3	2	78 to 61
38-40-----	2	2	78 to 53
38-40-----	1	2	78 to 49
8-----	3	2	76 to 58
8-----	2	2	83 to 34
8-----	2	1	83 to 52

<sup>1</sup> Ham filling in center sandwich if in 3 layers.

Finally, some well-known and commonly ignored precautions should be observed. Don't cook food well in advance of intended consumption. Don't forget leftovers, or assume that they are safe because they are in the refrigerator. Don't assume that the refrigerator supplies adequate chilling without testing the temperature. Refrigerator temperatures frequently are above 60° F. due to overloading,

frequent opening of doors, or failure to adjust the cooling system so that the temperature remains constantly below 40° F. Don't mix hot and cold, cooked protein food without thorough heating afterward. Don't assume that boiling questionable food makes it safe to eat, since boiling does not destroy staphylococcus enterotoxin. Don't depend on odor, taste, or appearance of food to determine whether it is safe to eat since the staphylococcus enterotoxin is odorless, colorless, and tasteless (9). Whether cooked protein food is safe to eat or not can be determined only by the total length of time it has been exposed to temperatures between 40° and 140° F.

### Summary and Conclusions

A survey of 95 outbreaks of staphylococcal food poisoning shows that the determining factor in the development of this disease lies solely in keeping cooked protein food warm or at room temperature for 4 hours or longer. Of 83 fully reported outbreaks, the vehicles in 95 percent were cooked protein food which was subsequently kept unrefrigerated or warmed, or both.

Contrary to currently accepted theory, it is clear that outbreaks commonly occur when the food is handled cleanly by personnel who are free of infections. The widespread presence of pathogenic staphylococci among healthy persons insures widespread contamination of food regardless of care in handling.

Therefore, recommendations for control of this disease have one objective: to prevent the staphylococci present in cooked protein food from forming enterotoxin.

In the absence of precise knowledge, the following standards were arbitrarily chosen to protect cooked protein food: 40° F. as the maximum temperature for keeping cold, cooked protein food; 140° F. as the minimum temperature for keeping hot, cooked protein food; 3 hours as the maximum length of time cooked protein food should be kept between 40° and 140° F.

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## Summer Session in Health Statistics

Statistics in the health sciences will be the subject of the 1960 graduate summer session, June 16 to July 30, 1960, sponsored by the accredited Schools of Public Health of the United States.

The University of Minnesota School of Public Health at Minneapolis is the host. The session will be held under a research training grant from the Division of General Medical Sciences of the National Institutes of Health, Public Health Service.

Courses offered will include: statistical methods in public health; management of health agency records; biostatistics in the health sciences; demographic methods in public health; registration and vital records; advanced biostatistics in the health sciences; statistical methods in epidemiology; sampling techniques in the health sciences; statistical methods in biological assay; and a lecture series.

A limited number of fellowships are available. Information may be obtained by writing to Professor J. E. Bearman, Biostatistics Division, University of Minnesota, Minneapolis 14, Minn.

# Prevalence of *Cryptococcus neoformans* in Pigeon Habitats

CHESTER W. EMMONS, Ph.D.

THE frequent occurrence of virulent strains of *Cryptococcus neoformans* in pigeon droppings under roosting sites and in old pigeon nests was first reported in 1955 (1). Prompt confirmation of this observation from Japan (2), Cincinnati, Ohio (3), and New York City (4) showed that this is not an unusual or geographically restricted association. The pigeon is not a host to *C. neoformans* but this pathogenic fungus grows as a saprophyte in pigeon manure and can be isolated from the majority of specimens collected in either rural or urban areas.

I have continued investigations of the prevalence of *C. neoformans* in the environment in order to estimate the frequency of man's possible exposure to the fungus and to evaluate in retrospect the accuracy of diagnoses in certain epidemics or focal outbreaks of pneumonitis which have been accepted as histoplasmosis.

## Materials and Methods

Most of the specimens studied have been collected in or near Washington, D.C. The specimens, consisting of dried and weathered pigeon manure from old nests or under roosting sites and relatively fresh droppings and soil from a city park where pigeons are fed by visitors, were scooped up into large glass tubes closed with cotton plugs.

Direct cultures were made by transferring

material from the specimen to agar slants. The slants were incubated at 37° C. in order to inhibit growth of many fungi. Part of each specimen was suspended in salt solution and injected intraperitoneally in mice in order to isolate *Histoplasma capsulatum* if it were present. Mice were killed after 1 month and cultures were made from spleen and liver in the manner previously described (1).

## Results

In the series reported here, virulent strains of *C. neoformans* which grew at 37° C. were isolated from 63 of 91 specimens. *H. capsulatum* was not isolated from any of the samples, although the methods used have been shown to be adequate for isolation of *H. capsulatum* from hundreds of other soil specimens. The following table shows the types of buildings or environments from which specimens were taken.

Sources of collections	Total number specimens collected	Number specimens positive
Warehouse, former barn.....	15	14
Old school building, now offices.....	10	7
Grain-milling establishment.....	5	3
Cupola on high school building.....	7	7
Window ledges, Federal and municipal office buildings.....	18	17
Public park.....	7	0
Railroad station.....	4	1
Barns (Virginia and Maryland)....	25	14
Total.....	91	63

The warehouse was formerly a dairy barn with two attached silos. For several years

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prior to this study it had been a government warehouse, and at the time the specimens were taken it had been emptied in preparation for demolition. It stood on the grounds of Junior Village in Washington, D.C., and I am indebted to officials of that institution for permission to collect specimens there.

The former public school building in the District of Columbia, now occupied by offices, is an old brick building with a large attic. The floor of the attic was covered with pigeon dung, nests, broken eggs, and carcasses of pigeons. It apparently fits very closely the description of a similarly infested old school building at Plattsburg, N.Y. (5). During the demolition of that building 23 men became ill with a pneumonitis diagnosed in retrospect and on inadequate evidence as histoplasmosis.

The grain-milling establishment attracted large numbers of pigeons and a few birds nested in some of the open buildings.

The cupola of a high school building and the window ledges of Federal and municipal buildings in Washington, D.C., presented the familiar types of shelters used by urban pigeons for nesting and roosting. I am greatly indebted for assistance in collection of specimens from these buildings to Wallace Coleman and Baker Wingfield, General Services Administration, and Clarence Travis, District of Columbia Health Department.

The one positive specimen from a railroad station was on a concrete floor beneath a ledge where pigeons nested.

Collections from barns were from nests on sills and other protected supports and from floors of haymows, as well as on hay piled deeply above mow floors under roosting stations.

Failure to isolate *C. neoformans* from seven soil specimens in a city park, is not conclusive evidence that the fungus does not grow in such areas. Additional samples will be taken from this and other parks.

## Discussion

The close association between man and pigeons in cities and in barns in the country, and the growth of *C. neoformans* in pigeon manure in old nests and under roosting sites

present theoretical and practical problems of considerable public health importance. The strains of *C. neoformans* isolated from these sources exhibit the same patterns of variability with respect to degree of virulence for mice, thickness of capsule, and acid production in various carbohydrates as strains of the fungus isolated from fatal cases of cryptococcal meningitis in man. It seems certain that man must be frequently exposed to this pathogenic fungus by inhalation of windblown cells from saprophytic environmental sources.

Knowing that virulent strains of *C. neoformans* are present in man's environment and assuming that cells of the fungus must be inhaled frequently, one can only speculate on the reasons for the infrequent recognition of pulmonary cryptococcosis in man. The most probable explanation is that primary pulmonary lesions occur as they do in histoplasmosis, that these lesions heal spontaneously because of innate resistance of the individual or because of immunity acquired during the slow evolution of the pulmonary lesion, and that the fungus reaches the central nervous system in only a small percentage of cases. Pulmonary lesions are indeed found in some cases of cryptococcal meningitis, and *C. neoformans* has been demonstrated in healed "coin lesions" in persons without active cryptococcosis (6).

Pulmonary cryptococcosis, limited in extent and duration, may be much more prevalent than is currently recognized. Presumptive evidence of extensive but benign pulmonary infection, without dissemination to the central nervous system, can be deduced from a study of certain epidemics of pneumonitis in which the type of exposure almost certainly precludes the presently accepted diagnosis of histoplasmosis, but makes the presumptive diagnosis of pulmonary cryptococcosis very probable.

One of the most interesting of these epidemics was the one at Plattsburg, N.Y., previously mentioned (5). In 1938, 23 men who tore down a school building became ill. The tower of the building "was filled with dead pigeons of various sizes and with pigeon droppings to a height of about 4 feet. Between the roof of the building and the ceiling of the gymnasium was another deposit of manure and dead pigeons about



2 feet in depth." The diagnosis of ornithosis was apparently ruled out. In retrospect, 15 years later, a diagnosis of histoplasmosis was made. The evidence accepted for the diagnosis in this and similar epidemics was hypersensitivity to histoplasmin, positive serologic tests, development of miliary calcification, and isolation of *H. capsulatum* from soil at the point source of the epidemic (7). Serologic cross reactions between cryptococcosis and histoplasmosis occur so that this evidence is equivocal.

In the case of the Plattsburg epidemic, the isolation of *H. capsulatum* from 1 of 24 soil specimens was reported. The soil sample was taken from the dirt floor of a church two doors from the site of the demolished school house some 15 years after the epidemic. The probability of contaminating a soil sample from the air of a laboratory has been discussed in a previous paper (1). The most convincing retrospective evidence against a diagnosis of histoplasmosis in the Plattsburg epidemic is that *H. capsulatum* has never been isolated from accumulations of pigeon manure in the upper floors of a building, but virulent strains of *C. neoformans* are regularly present in such material. Similar evidence against a diagnosis of histoplasmosis and for a diagnosis of pulmonary cryptococcosis can be presented for epidemics of pneumonitis at Warrenton, N.C. (7), and Mandan, N. Dak. (8).

### Summary

Virulent strains of *Cryptococcus neoformans* are generally present in pigeon manure in old pigeon nests and under roosting sites. Recent additional isolations of this pathogenic fungus from varied types of rural and urban environments are reported. The frequent occurrence of *C. neoformans* in man's environment presents a hazard not recognized prior to 1955.

*Histoplasma capsulatum* has not been iso-

lated from pigeon manure in upper floors of buildings. *C. neoformans*, however, is very frequently present in pigeon manure from haymows in barns and from upper floors of buildings which have sheltered pigeons. In view of these facts, the circumstantial evidence for a diagnosis of a previously unrecognized pulmonary form of cryptococcosis is as strong as the circumstantial evidence for a diagnosis of histoplasmosis in certain past epidemics of pneumonitis in men who were exposed to pigeon manure while demolishing old buildings which had sheltered pigeons. Until such epidemics can be studied systematically at the time they occur, instead of in retrospect, and until cultures and adequate serologic studies are made, the etiology of the type of pneumonitis reported will remain equivocal.

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*The future of the limited purchase-of-service program that the Philadelphia Department of Public Health launched in 1958 may depend on the development and administration of standards mutually acceptable to the purchaser and the supplier.*

## Contract Care for Indigent Mothers in Philadelphia

HARRIET F. BERGER, M.A.

IN Philadelphia, an indigent expectant mother may deliver her baby free of charge, by courtesy of the city's maternity contract hospitalization program. Now in its second year, this program has reaped immediate practical and political advantages. Whether this limited purchase-of-service program will be expanded to a long-range program of tax-supported hospital and medical care for the needy is likely to depend upon the development and refinement of relevant standards of medical care and the comparative costs of the contract and a municipal program for the medically indigent one-fifth of the city's population.

Over the years the interests of various professional and lay groups foreshadowed a tax-supported and privately administered method of caring for medically needy citizens. The Community Policy Committee on Health and Hospital Services, the Duane committee, a group of 20 citizens appointed by the mayor from government, hospitals, medical schools, the nursing and medical professions, minority groups, industry, and organized labor, concluded in April 1959 that the care of the medically needy, formerly supported by private

charity in voluntary hospitals and clinics, had become a "proper public responsibility." Underscoring this policy, the Community Chest announced in April 1959 that starting in 1961 the chest would no longer pay some 18 voluntary hospitals their annual grant of \$1,300,000 for "charity" cases, because donations from private sources were insufficient to fulfill this essentially governmental obligation.

Despite this "transfer of financial responsibility," the Duane committee did not foresee a similar transfer of administrative responsibility. It recommended that the city purchase service from voluntary hospitals, simultaneously providing care, bolstering to a modest degree the financial condition of the voluntary hospitals (1), and utilizing the community's hospital resources.

The alternative to a purchase-of-service program was to care for these patients at the Blockley Division of Philadelphia General Hospital with accompanying increases in the hospital's capital and operating budgets. Faced with this alternative and supported by various powerful professional, lay, and religious groups with a stake in continuing traditional community patterns of hospital practice, the city embarked on its contract maternity hospitalization program under the impetus of the closing in January 1958 of the uneconomic Northern Division of the Philadelphia General Hospital.

Designed to care initially for the Northern Division's maternity patients, the new agree-

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*Mrs. Berger's paper is based on research undertaken while working toward a doctor of philosophy degree in the department of political science of the University of Pennsylvania, Philadelphia. She is a former labor education specialist for the American Labor Education Service.*

ments in 1958 provided maternity care at the Temple University Hospital for 1,400 patients at a total cost of \$217,000. In 1959 the department expanded the program to cover 2,000 patients at a total cost of \$300,000 at Hahnemann Hospital as well as Temple. Other indigent maternity patients, about 25 percent of the estimated universe of medically needy maternity patients, are delivered at the Blockley Division and the rest find their way to voluntary hospitals supported by fees, private funds, and State aid, which are not in the contract program.

In 1955 the Philadelphia Board of Health estimated that 21.7 percent, or 462,618 persons, of the total 2,100,000 population could be defined as medically needy. The 1959 expansion of the maternity hospitalization program parallels the recommendation of the Community Policy Committee on Health and Hospital Services that the city council provide "additional financial assistance to voluntary hospitals initially in the field of additional care for maternity cases and for out-patient service" (1). Therefore, the issues of the current program are viewed in the light of a possible expansion in maternity and other hospital and clinic services, perhaps to the extent of a comprehensive tax-supported medical care and hospitalization program for the needy.

### The Agreements

The agreements between the city and Temple and Hahnemann Hospitals provide for the payment of \$150 per confinement provided no payment is received from any other sources for complete care of indigent maternity patients. Benefits include a minimum of five prenatal visits to the clinic, treatment of special conditions of pregnancy, delivery including use of operating room, if needed, a minimum of 5 days of hospitalization, care of the infant, and post-natal care.

Eligibility for the program is determined by the same tests applied to persons who seek free care at Philadelphia General Hospital which has worked out a standard of eligibility based on income, family size, resources, age, duration and severity of illness, employment opportunities, and past medical expenses, plus a schedule for part payment applied to all hos-

pital patients (2,3). City interviewers, stationed in the areas where most of the patients live, interview applicants and direct eligibles to the proper clinic for prenatal care. A faculty committee of the University of Pennsylvania found that the Philadelphia General Hospital was the only hospital in the State with a carefully rationalized and professionally administered procedure for determining eligibility (4).

### Standards of Care

One critical factor of a purchase-of-service program is its quality or standard. The cooperative establishment of standards requires a far more intimate knowledge of and an index to the problems of a maternal health program than now exists. Under the health code the department permits only fully accredited hospitals to operate maternity and infant services, whether or not they participate in the contract program, and accreditation provides a basic minimum standard below which no hospital maternity or pediatric department is allowed to fall. But above the minimum standard a wide area of discretion exists.

The chief of the maternal and child health section of the department of health, who administers the contract program, is concerned most with the health of the pregnant, nonwhite woman, the majority of the city's patients, and the high fetal death rate in this group. However, the traditional crude system of reporting rates of live births, fetal deaths, maternal deaths, and neonatal deaths does not develop adequately the relationship between death and disability and relevant medical, economic, and sociological factors such as medical and hospital facilities, economic distribution, extent of prenatal care, method of delivery, occupation, race, literacy, education, and incidence of toxemia. Recently, the department adopted a regulation requiring reporting information as a basis for the development of a refined index to the management of deficient infants, the complications of pregnancy, and the complications and conditions of maternity. Using the data obtained in this way the department hopes to be able to secure the cooperation of the hospitals and of the obstetric and pediatric chiefs

in establishing better standards of maternity care and compliance with them.

Even before developing a maternal health profile the maternal and child health section attacked one of the major defects of the program, the extremely low standards of prenatal care. Part of the difficulties stems from faulty administrative scheduling of prenatal visits, part from weak motivation of the patients, and part from a lack of coordination between the prenatal clinic and the hospital. As a result the city has been purchasing a delivery service rather than a maternal health program. By decentralizing the clinic program, putting it directly under the jurisdiction of the chief of obstetrical service in whose hospital the patients are delivered, and by refusing to reimburse for patients who are not registered for prenatal care, the city hopes to facilitate clinic visits, fix responsibility, and instill in both patients and attending physicians and nurses a sense of the urgent need for prenatal care.

The limited experience of earlier purchase-of-service programs indicates that the development and administration of mutually acceptable standards may become the critical factor in the success of the program. For example, the wartime Federal Emergency Maternal and Infant Care Program, which started out on a strict indemnity payment basis, concluded by insisting on rigid standards for reimbursement for dependents' medical care in order to assure its beneficiaries of even minimal standards. In many cases, where possible, EMIC took dependents into service hospitals, rather than subject them to the uncertain conditions of voluntary civilian institutions.

The most thorough study of the administrative and financial aspects of tax-supported hospital care for the medically needy in Pennsylvania (4) gives only "incidental consideration to the qualitative and quantitative adequacy of medical institutional facilities." However, the authors of the study state emphatically that the Commonwealth should get full value for every dollar expended through rigorous licensing and inspection procedures, periodic filing of financial reports, and imposition of regular audits; that its own medical staff attached to the department of public assistance enforce standards of medical care with regard to length of stay,

elective procedures, and long-term care; and that local medical staffs undertake medical audits according to State standards.

### Costs of Care

The city is taking measures to control the costs of the contract program as well as the costs of its hospital insurance plan for municipal employees. Moving to insure payment only for services received, the department revised its maternity agreements in 1959 to discourage the practice of cutting short the hospitalization period by both patients and hospital. Formerly providing for lump-sum payment, the agreements now establish a sliding scale of reimbursement based on the number of days the patient is in the hospital: \$50 for the first day, \$25 for the second day, and the balance at the rate of approximately \$22.50 a day until the full \$150 is earned.

As subscriber to hospital insurance with the Associated Hospital Service for some 8,000 municipal employees, the city is further concerned with costs of hospital care reflected in premium rates. Between June 1958 and August 1959, AHS premium rates jumped 71.14 percent because of increased utilization and rising hospital costs. In 1958 the city's vigorous participation in the rate hearings of the State Insurance Commission produced the first public record of the complex relationships of the carrier, the participating hospitals, and the subscribers, embracing varying costs among hospitals, establishment of hospital rates and charges, and reimbursements to hospitals, and laid the groundwork for future regulation.

Meeting increasing hospital costs through hospitalization premiums or through reimbursement without exercising direct control of medical care standards and administration may challenge the city as it has already challenged other purchasers of hospital and medical care. For example, the deputy executive medical officer of the Welfare and Retirement Fund, United Mine Workers Association, concludes after 10 years of attempting to purchase hospital and medical care from voluntary hospitals and private practitioners in the Appalachian Mountain mining areas that "contracting out" has resulted in expensive and inferior medicine. He found that construction and operation of its

own hospitals and group practice clinics in some areas was the fund's only satisfactory method of assuring its member beneficiaries quality medicine (5).

In Philadelphia, the administrator of the American Federation of Labor Medical Plan, a diagnostic clinic serving 64,000 members of 30 affiliates, who is a member of the Duane committee, shares this point of view and finds a parallel in it for the city's program. He supported wholeheartedly the closing of the uneconomic Northern Division and the purchase of maternity care for a limited group of indigent maternity patients. Nevertheless, he is concerned about the consequences, both to standards and costs, if and when the contract program is extended into a general medical care program. Contracting out to voluntary hospitals, he believes, will result in the hospitals and other medical care agencies telling the city what kind of medical care they are willing to provide instead of providing the care the city requires and may well push the cost of the program beyond the financial limits set by the city council. He would prefer to see the city develop its own hospital and group practice program to care for the needy and simultaneously serve as a yardstick for the rest of the community.

Meanwhile the AFL Medical Plan and Center is going forward with its program for the construction and operation of its own hospital because its affiliated unions are dissatisfied with the benefits provided for their members through AHS under their collective bargaining agreements. Evidence leading to a similar conclusion on the comparative cost in 1947 of providing care for veterans in civilian hospitals and constructing and operating more Veterans Administration hospitals was given by Admiral Joel T. Boone, M.D., in testimony at the 1947 hearings of the Senate Subcommittee on Labor and Public Welfare on "National Health Programs" (6).

Nevertheless, government purchase of service to provide medical care for the needy is used widely in many jurisdictions, for example, New York State, New York City, and the Federal Government's share of funds spent by the State for vendor payments to public assistance clients. In the private sector, the UMWA

continues to contract out a sizable proportion of hospital care for its fund beneficiaries where no other alternative is practicable. The experience of these entities is timely and relevant in this critical area of Philadelphia's health programs, the establishment and administration of standards of hospital and medical care.

### Conclusion

Philadelphia's modest purchase of hospital care for indigent maternity patients contains within it the ingredients of any future expanded tax-supported hospital and medical care program for its needy citizens, the development and enforcement of standards, and the immediate and ultimate costs of care. Perhaps in this program, as former Health Commissioner James P. Dixon hopes, the department of public health may become a "bridge between conventional institutions of medical care and the community as a whole, can assure the community that standards of medical care in these institutions are being maintained (and that they are) capable of meeting health needs . . ." (7). Whether the department achieves this goal depends not only on its own leadership but also on the talents, imagination, and social responsibility of the medical community.

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## Wide Focus for Industrial Health

A broadened prospect for industrial health was signaled at the 24th Annual Meeting of the Industrial Hygiene Foundation, October 28-29, 1959, at Mellon Institute, Pittsburgh, Pa.

Complementary addresses by Surgeon General Leroy E. Burney, Public Health Service, and George A. Jacoby, director of personnel relations, General Motors Corporation, emphasized that with respect to health and safety services the industrial employee enjoys far better protection on the job than at home or on the street.

Although General Motors employees have a safety record better than average, Jacoby pointed out, of every 13 accidental injuries they suffered last year, 12 happened off the job. He also described the medical care plan provided for General Motors employees and their families.

Dr. Burney began by emphasizing the dependence of the growing urban population upon industrial technology. For example, he cited the staggering effects of disruption of a city's water or electrical system. He also mentioned the slow pace of biological and social change in contrast with industrial transition, with the result that society fails to achieve full benefits of modern technology. For the same reason, it fails to protect itself against emergent hazards. "When hundreds—literally hundreds—of separate political jurisdictions . . . are involved in a single metropolitan area," he said, "such basic requirements as water supply . . . can be provided only with difficulty and at unnecessarily heavy public expense."

Industry has been much quicker to rise to the demands of technological change than government or civic organizations, he noted. "Industry spends billions to eliminate or effectively control hazardous exposures in the working environment," he observed. "In plants operated by responsible, well-organized industries, the worker has better protection than in his community. I do not know of a single one of our urban communities where environmental controls for the protection of the general population measure up in scope and quality to those maintained by the majority of our larger industrial establishments."

"From the point of view of a physician," he added, "it is difficult not to see an inevitable merging of the problems of industrial health with those of community health."

As targets in this process, he named first an increase in knowledge of environmental factors bearing on individual and public well-being; second, application of available knowledge "to the full" in eliminating or controlling environmental hazards.

He concluded, "I do not count myself among those prophets of doom who periodically predict the end of man as a result of his own achievements. The historical means of maintaining a hypothetical ecologic balance are famine, disease, and war. Yet it would be unthinkable not to combat these conditions. The history of man on earth in a fundamental sense is the history of his efforts to win plenty, health, and peace."

Dr. Henry H. Kessler, director of the Kessler

Institute for Rehabilitation, West Orange, N.J., reminisced informally upon events in rehabilitation since he was inducted into this work by Col. Lewis T. Bryant, who told him, "Don't be an ordinary doctor. I want you to know the workman through and through."

"In 40 years," he said, "the concept of rehabilitation has barely dented the consciousness of the public or the medical profession, although cure means rehabilitation in a relatively simple condition, such as a broken arm. Loss of a limb or a spinal injury, however, needs many hands and the support of the whole community. It is a lucky community that can apply all its resources to rehabilitation."

Such a community, he continued, begins before amputation to prepare a patient for the emotional strain: the shock is akin to grief, which needs specific management. "In the mind of the patient are the questions: will I work again? walk? what will happen? Concrete evidence to answer such questions is needed; moving pictures of rehabilitation or personal demonstrations, if possible, reassure patients, where a pat on the back will not."

He also emphasized the value of professional collaboration. Dr. Kessler does not write a prescription for prosthesis unless the maker and the therapist are standing by to consult and advise. Also, he said, fitting of prosthetic devices is a shared endeavor. In the objective of restoring some degree of independence, apart from the medical treatment, testing and place-

ment services, he said, are also essential. Even though some patients are "socially inoperable," most of them can be placed, he said, if not in former positions, in shelter work, or in tasks that can be done at home. Their potentials as a rule are underestimated, he added. "One patient returned to work successfully at his old trade, as a steel rigger on the upper levels, minus his legs."

Recommending a rehabilitation center available to every community, Dr. Kessler favored a minimum size of 40 beds and 60 outpatients. For such an institution, he estimated a need for a staff of 80 and a budget of \$100,000 annually. He said a center could operate at half that size but should not be reduced more than that unless its services were limited to outpatients. About 25 outpatients, he estimated, might be served with 2 physical therapists, 2 occupational therapists, a speech therapist for hemiplegics, and a nurse to coach patients in the simple tasks of daily living.

Affiliation of such a center with a hospital, rather than with a health department, he believes, is likely to offer the most advantages.

Other speakers at the conference dealt with such broad subjects as stream pollution, atmospheric pollution, community zoning, epidemiological methods, food additives, mental health, and radiation.

All papers offered at the meeting are being published in the Archives of Industrial Medicine and Occupational Health.

## Nursing Home Services Section

A Nursing Home Services Section has been established within the Chronic Disease Branch, Division of Special Health Services, Bureau of State Services, Public Health Service.

The newly created section will provide consultative services on matters relating to clinical services, administrative management, and licensing of nursing homes and homes for the aged. The unit will conduct studies and analyze needs relating primarily to services given in such facilities and develop guides for their operation. It will also develop guides relating to State licensure laws and rules and regulations pertaining to nursing homes and homes for the aged.

Dr. Bruce Underwood is chief of the section. Other members of the staff are Kenneth R. Nelson, Jr., consultant in administrative management of medical care facilities; Mrs. Frances S. Wolford, nursing consultant; and Mrs. Charlotte Enterline, secretary.

# Milk Sanitation Honor Roll for 1958-59

Fifty-three communities have been added to the Public Health Service milk sanitation "honor roll," and 44 communities on the previous list have been dropped. This revision covers the period from January 1, 1958, to December 31, 1959, and includes a total of 295 cities and 100 counties.

Communities on the honor roll have complied substantially with the various items of sanitation contained in the milk ordinance recommended by the U.S. Public Health Service. The State milk sanitation authorities concerned report this compliance to the Service. The rating of 90 percent or more, which is necessary for inclusion on the list, is computed from the weighted average of the percentages of compliance. Separate lists are compiled for communities in which all market milk sold is pasteurized, and for those in which both raw milk and pasteurized milk are sold.

The recommended milk ordinance, on which the milk sanitation ratings are based, is now in effect through voluntary adoption in 491 counties

*This compilation is from the Milk and Food Program, Division of Engineering Services of the Bureau of State Services, Public Health Service. The previous listing, with a summary of rules under which a community is included, was published in Public Health Reports, September 1959, pp. 844-847. The rating method is described in PHS Publication No. 678 (Methods of Making Sanitation Ratings of Milksheds).*

and 1,425 municipalities. The ordinance also serves as the basis for the regulations of 36 States. In 16 States it is in effect statewide.

The ratings do not represent a complete measure of safety, but they do indicate how closely a community's milk supply conforms with the standards for grade A milk as stated

in the recommended ordinance. High-grade pasteurized milk is safer than high-grade raw milk because of the added protection of pasteurization. The second list, therefore, shows the percentage of pasteurized milk sold in a community which also permits the sale of raw milk.

Although semiannual publication of the list is intended to encourage communities operating under the recommended ordinance to attain and maintain a high level of enforcement of its provisions, no comparison is intended with communities operating under other milk ordinances. Some communities might be deserving of inclusion, but they cannot be listed because no arrangements have been made for determination of their ratings by the State milk sanitation authority concerned. In other cases, the ratings which were submitted have lapsed because they are more than 2 years old. Still other communities, some of which may have high-grade milk supplies, have indicated no desire for rating or inclusion on this list.

## Communities awarded milk sanitation ratings of 90 percent or more, 1958-59

### 100 PERCENT OF MARKET MILK PASTEURIZED

Community	Date of rating	Community	Date of rating	Community	Date of rating
<i>Arkansas</i>		<i>Georgia</i>		<i>Georgia—Continued</i>	
Fort Smith.....	Aug. 7, 1959	Albany.....	Dec. 5, 1958	Moultrie.....	Oct. 29, 1958
<i>Colorado</i>		Athens.....	May 8, 1959	Paulding County....	July 25, 1958
Boulder County.....	Aug. .. 1958	Atlanta.....	Aug. 6, 1959	Quitman.....	Aug. 13, 1958
Denver and Denver		Augusta.....	May 23, 1959	Rome-Floyd	
County.....	May .. 1959	Bainbridge.....	Mar. 25, 1958	County.....	Aug. 6, 1959
Las Animas-Huerfano		Brunswick.....	Nov. 9, 1959	Savannah.....	July 18, 1958
Counties.....	Apr. 22, 1958	Cairo.....	May 7, 1958	Valdosta.....	Mar. 12, 1958
Pueblo County.....	Aug. 13, 1959	Calhoun-Gordon		Waycross.....	Mar. 14, 1958
Weld County.....	July 23, 1959	County.....	Aug. 12, 1958		
<i>District of Columbia</i>		Canton.....	Oct. 30, 1958	<i>Illinois</i>	
Washington.....	Mar. 6, 1958	Columbus.....	Jan. 23, 1959	Chicago.....	May 4, 1959
		Douglas County.....	July 25, 1958	East Side Health	
		Fitzgerald.....	May 27, 1959	District.....	June 5, 1958
		La Grange.....	Oct. 8, 1958		



**Communities awarded milk sanitation ratings of 90 percent or more, 1958-59—Continued**

<i>Community</i>	<i>Date of rating</i>	<i>Community</i>	<i>Date of rating</i>	<i>Community</i>	<i>Date of rating</i>
<i>Illinois—Continued</i>		<i>Kentucky—Continued</i>		<i>Kentucky—Continued</i>	
East Side Health District—Continued		Benton and Marshall County.....	Feb. 8, 1958	Smithland and Livingston County.....	Feb. 7, 1958
Brooklyn		Bowling Green and Warren County....	May 14, 1959	Taylorsville and Spencer County....	June 30, 1958
Cahokia		Butler and Falmouth..	Apr. 2, 1958	Webster County.....	May 22, 1958
East St. Louis		Campbellsville.....	Feb. 13, 1959		
Fairmont City		Covington.....	May 28, 1959	<i>Mississippi</i>	
National City		Cynthiana and Harrison County.....	Apr. 8, 1958	Amory.....	May 7, 1959
Washington City		Danville and Boyle County.....	Apr. .... 1958	Biloxi.....	Oct. 8, 1959
Elgin.....	Sept. 19, 1958	Elizabethtown.....	Jan. 8, 1958	Booneville.....	May 6, 1959
Joliet.....	Mar. 27, 1959	Frankfort.....	Oct. 8, 1959	Brookhaven.....	Jan. 15, 1958
Peoria.....	Apr. 17, 1958	Fulton and Fulton County.....	Aug. 12, 1959	Canton.....	Sept. 30, 1958
<i>Indiana</i>		Glasgow.....	Jan. 17, 1959	Clarksdale.....	Dec. 17, 1958
Anderson.....	Dec. 3, 1958	Georgetown and Scott County.....	Oct. 9, 1959	Columbia.....	Aug. 7, 1958
Berne-Bluffton area..	Oct. 17, 1958	Greenville.....	Jan. 21, 1958	Columbus.....	July 16, 1958
Bloomington.....	Jan. 10, 1958	Hardinsburg and Breckinridge County.....	Oct. 22, 1958	Corinth.....	Apr. 9, 1959
Bremen.....	Jan. 29, 1958	Henderson County....	July 10, 1959	Greenville.....	Oct. 21, 1958
Columbia City.....	June 20, 1958	Hodgenville.....	Oct. 20, 1958	Grenada.....	Sept. 17, 1959
Cooperative Grade A area.....	Feb. 13, 1958	Hopkinsville and Christian County..	July 16, 1959	Hattiesburg.....	May 16, 1958
Holland		Jessamine County....	June 17, 1959	Hernando.....	Dec. 19, 1958
Huntingburg		Liberty.....	Nov. 18, 1958	Houston.....	Apr. 15, 1959
Jasper		Louisville and Jefferson County.....	Mar. .... 1958	Iuka.....	Apr. 8, 1959
Tell City		Mayfield and Graves County.....	May 6, 1959	Jackson.....	Mar. 26, 1959
Evansville.....	June 5, 1958	Monticello.....	June 19, 1958	Kosciusko.....	June 12, 1958
Fort Wayne.....	July 15, 1958	Morehead.....	Feb. 3, 1959	Laurel.....	May 20, 1958
Frankfort.....	Feb. 10, 1959	Morgantown.....	Jan. 10, 1958	Louisville.....	Aug. 18, 1958
Huntington.....	Jan. 14, 1959	Mount Sterling.....	June 16, 1959	Macon.....	Feb. 26, 1958
Kokomo.....	Feb. 10, 1959	Murray and Calloway County.....	Feb. 5, 1958	Meadville.....	Feb. 25, 1959
Lafayette and W Lafayette.....	May 5, 1958	Newport and Campbell County.....	Sept. 18, 1959	Meridian.....	Feb. 27, 1958
Logansport.....	Mar. 27, 1958	Owensboro.....	May 9, 1958	New Albany.....	Aug. 27, 1959
Madison.....	July 23, 1958	Owenton.....	Mar. 31, 1958	Oxford.....	July 2, 1959
Marion County.....	Apr. 2, 1958	Owingsville.....	June 16, 1959	Picayune.....	June 11, 1959
Michigan City.....	Apr. 23, 1958	Paducah and McCracken County....	May 1, 1959	Starkville.....	Feb. 10, 1959
Monticello.....	Oct. 16, 1958	Paris and Bourbon County.....	June 15, 1959	State College.....	Feb. 11, 1959
Muncie.....	May 20, 1958	Pendleton County....	Apr. 2, 1958	Tupelo.....	Jan. 27, 1959
New Castle.....	Apr. 24, 1958	Pike County.....	July 22, 1958	Vicksburg.....	Jan. 27, 1959
North Manchester..	Dec. 16, 1958	Prestonsburg and Floyd County.....	July 22, 1958	West Point.....	July 15, 1958
Peru.....	Oct. 30, 1958	Shelby County.....	Jan. 17, 1958		
Rochester.....	Sept. 17, 1958			<i>Missouri</i>	
Warsaw.....	Aug. 15, 1958			Kansas City.....	June 11, 1958
<i>Iowa</i>				St. Joseph.....	Apr. 14, 1958
Cedar Rapids.....	Oct. 9, 1958			St. Louis County....	June 4, 1958
Davenport.....	July 24, 1958			Sikeston.....	Feb. 11, 1958
Des Moines.....	July 3, 1958			Springfield.....	May 13, 1958
Dubuque.....	June 20, 1958			<i>Nebraska</i>	
Iowa City.....	Oct. 9, 1958			Lincoln.....	July 16, 1958
<i>Kentucky</i>				Omaha.....	Feb. 19, 1958
Ashland and Boyd County.....	July 23, 1959			<i>New Mexico</i>	
Bell County.....	Aug. 4, 1959			Albuquerque.....	Sept. 11, 1958

# Communities awarded milk sanitation ratings of 90 percent or more, 1958-59—Continued

Community	Date of rating	Community	Date of rating	Community	Date of rating
<i>North Carolina</i>		<i>Tennessee</i>		<i>Texas—Continued</i>	
Alexander County.....	Jan. 9, 1959	Athens.....	Sept. 3, 1959	Bryan.....	July 17, 1959
Beaufort County.....	May 14, 1959	Chattanooga-Hamil- ton County.....	Oct. 9, 1958	Burkburnett.....	Aug. 11, 1959
Bertie County.....	Feb. 7, 1958	Clarksville.....	Feb. 7, 1958	Cleburne.....	Jan. 17, 1958
Bladen County.....	Apr. 9, 1958	Cleveland.....	Sept. 2, 1959	College Station.....	July 16, 1959
Burke County.....	Aug. 18, 1959	Clinton.....	Sept. 16, 1958	Corpus Christi.....	May 11, 1959
Camden County.....	May 2, 1958	Columbia.....	May 19, 1958	Dallas.....	Nov. 17, 1958
Catawba County.....	Jan. 9, 1959	Cookeville.....	Apr. 18, 1958	Denver City.....	June 8, 1959
Chowan County.....	May 2, 1958	Covington.....	Dec. 12, 1958	Edinburg.....	Mar. 14, 1958
Craven County.....	July 24, 1959	Cowan.....	Oct. 16, 1958	El Paso.....	Sept. 11, 1959
Cumberland County.....	Mar. 28, 1958	Decherd.....	Oct. 16, 1958	Falfurrias.....	Sept. 10, 1959
Durham County.....	Apr. 22, 1958	Dyersburg.....	Nov. 18, 1958	Fort Worth.....	May 28, 1959
Edgecombe County.....	Sept. 10, 1959	Erwin.....	Oct. 30, 1958	Galveston.....	June 27, 1958
Forsyth County.....	Dec. 12, 1958	Fayetteville.....	June 10, 1958	Gonzales.....	July 24, 1959
Gates County.....	July 31, 1958	Franklin.....	May 15, 1958	Grand Prairie.....	Nov. 28, 1958
Guilford County.....	June 18, 1958	Greeneville.....	Jan. 28, 1958	Greenville.....	Dec. 12, 1958
Halifax County.....	June 22, 1959	Humboldt.....	Nov. 5, 1958	Harlingen.....	Sept. 10, 1959
Harnett County.....	Oct. 15, 1958	Huntingdon.....	Oct. 28, 1958	Houston.....	June 13, 1958
Haywood County.....	Mar. 14, 1958	Jackson-Madison County.....	Oct. 14, 1958	Jacksonville.....	Dec. 17, 1958
Henderson County.....	Oct. 20, 1958	Kingsport.....	Jan. 30, 1958	Kingsville.....	May 6, 1959
Hertford County.....	July 31, 1958	Knoxville.....	May 6, 1959	Levelland.....	June 11, 1959
Iredell County.....	July 1, 1958	Lewisburg.....	June 9, 1958	Lubbock.....	Aug. 14, 1958
Jackson County.....	Mar. 19, 1959	Lexington.....	Oct. 30, 1958	Lufkin.....	July 9, 1958
Lenoir County.....	Apr. 7, 1959	Livingston.....	Jan. 7, 1959	McAllen.....	Mar. 14, 1958
Lincoln County.....	Jan. 9, 1959	Loudon.....	May 26, 1958	Midland.....	Aug. 21, 1959
Macon County.....	Mar. 19, 1959	Manchester.....	Oct. 15, 1958	Mineral Wells.....	July 10, 1959
Martin County.....	Aug. 13, 1958	Memphis.....	Aug. 18, 1959	Odessa.....	Aug. 21, 1959
Mecklenburg County.....	Oct. 23, 1959	Milan.....	Nov. 11, 1958	Paris.....	Feb. 4, 1959
Moore County.....	May 15, 1958	Morristown.....	July 10, 1958	Plainview.....	Oct. 8, 1958
Nash County.....	Oct. 14, 1959	Mountain City.....	Oct. 28, 1958	San Angelo.....	Sept. 4, 1959
New Hanover County.....	Apr. 21, 1958	Mount Pleasant.....	May 19, 1958	San Antonio.....	Mar. 6, 1959
Northampton County.....	July 31, 1958	Murfreesboro.....	July 21, 1959	San Benito.....	Sept. 18, 1959
Onslow County.....	May 13, 1959	Nashville-Davidson County.....	Oct. 21, 1959	Seagraves.....	June 8, 1959
Pamlico County.....	Aug. 28, 1959	Newbern.....	Nov. 18, 1958	Seminole.....	June 8, 1959
Pasquotank County.....	May 2, 1958	Newport.....	Jan. 7, 1958	Sweetwater.....	Sept. 25, 1959
Pender County.....	Mar. 2, 1959	Paris.....	Sept. 4, 1958	Texarkana.....	June 24, 1959
Perquimans County.....	May 2, 1958	Pulaski.....	Aug. 3, 1959	Tyler.....	Sept. 26, 1958
Pitt County.....	Apr. 1, 1958	Rogersville.....	Jan. 29, 1958	Victoria.....	Jan. 19, 1959
Richmond County.....	July 30, 1958	Sparta.....	Apr. 18, 1958	Wichita Falls.....	Oct. 23, 1959
Rocky Mount.....	Oct. 14, 1959	Sweetwater.....	Sept. 23, 1958		
Sampson County.....	May 22, 1958	Trenton.....	Nov. 5, 1958		
Stanly County.....	Sept. 10, 1958	Tullahoma.....	Oct. 13, 1958		
Swain County.....	Mar. 19, 1959	Waverly.....	Aug. 26, 1958		
Transylvania County.....	Oct. 20, 1958	Winchester.....	Oct. 16, 1958		
Tyrrell County.....	Feb. 6, 1958				
Union County.....	Dec. 4, 1958				
Washington County.....	Feb. 6, 1958				
Wayne County.....	Nov. 5, 1959				
Wilson County.....	Aug. 28, 1959				
<i>Oklahoma</i>		<i>Texas</i>		<i>Utah</i>	
Mangum.....	Nov. 12, 1959	Amarillo.....	Apr. 14, 1959	Logan.....	May 22, 1958
Okmulgee.....	Oct. 16, 1959	Big Spring.....	Aug. 21, 1959	Salt Lake City.....	May 6, 1958
Tulsa.....	June 15, 1959	Borger.....	June 27, 1958		
		Brownfield.....	June 9, 1959		
		Brownwood.....	June 29, 1959		
				<i>Virginia</i>	
				Alexandria.....	June 10, 1959
				Blacksburg.....	Aug. 7, 1958
				Christiansburg.....	Aug. 7, 1958
				Colonial Heights.....	Nov. 7, 1958
				Lynchburg.....	Apr. 14, 1959
				Marion.....	Apr. 22, 1959
				Norfolk.....	June 5, 1958
				Petersburg.....	Nov. 7, 1958
				Portsmouth.....	Mar. 27, 1959

# Communities awarded milk sanitation ratings of 90 percent or more, 1958-59—Continued

<i>Community</i>	<i>Date of rating</i>	<i>Community</i>	<i>Date of rating</i>	<i>Community</i>	<i>Date of rating</i>
<i>Virginia—Continued</i>		<i>Wisconsin</i>		<i>Wisconsin—Continued</i>	
Pulaski.....	Aug. 7, 1958	Appleton.....	Jan. 13, 1959	Fontana.....	Dec. 11, 1958
Radford.....	Aug. 7, 1958	Beaver Dam.....	Feb. 13, 1959	Fort Atkinson.....	Dec. 11, 1958
Richmond.....	Apr. 18, 1958	Beloit.....	Jan. 23, 1958	Kaukauna.....	Jan. 6, 1959
Roanoke.....	July 3, 1958	Burlington.....	Dec. 11, 1958	La Crosse.....	Aug. 26, 1958
South Boston.....	May 13, 1959	Clintonville.....	Feb. 11, 1958	Lake Geneva.....	Dec. 11, 1958
Staunton.....	Apr. 4, 1958	Delavan.....	Dec. 11, 1958	Neenah-Menasha.....	Dec. 2, 1958
<i>Washington</i>		Eau Claire County		Oshkosh.....	July 9, 1958
Spokane.....	Oct. 29, 1958	(Eau Claire, Altoona, Augusta, and		Ripon.....	Feb. 13, 1959
Tacoma.....	Aug. 25, 1959	Fairchild).....		Stevens Point.....	Feb. 19, 1959
Whitman County.....	Oct. 17, 1958	Elkhorn.....	Dec. 11, 1958	Waupun.....	Feb. 13, 1959
				Williams Bay.....	Dec. 11, 1958

## BOTH RAW AND PASTEURIZED MARKET MILK

<i>Community and percent of milk pasteurized</i>	<i>Date of rating</i>	<i>Community and percent of milk pasteurized</i>	<i>Date of rating</i>	<i>Community and percent of milk pasteurized</i>	<i>Date of rating</i>
<i>Arkansas</i>		<i>North Carolina</i>		<i>Texas—Continued</i>	
Little Rock, 99.8.....	Oct. 14, 1959	Buncombe County, 99.1.....	Sept. 30, 1959	Brenham, 95.5.....	July 11, 1958
<i>Georgia</i>		Cleveland County, 91.8.....	Sept. 11, 1958	Brownsville, 99.3.....	Aug. 27, 1959
Americus, 94.9.....	Aug. 25, 1958	Robeson County, 98.....	Mar. 11, 1958	Denton, 97.7.....	July 30, 1959
Carrollton, 99.8.....	Feb. 12, 1959	Wake County, 99.9.....	Jan. 27, 1958	Hereford, 97.....	Mar. 27, 1959
Gainesville, 95.6.....	Sept. 19, 1958	Wilkes County, 99.48.....	May 8, 1958	Laredo, 96.6.....	June 9, 1959
Macon, 99.85.....	Nov. 12, 1959	<i>Oklahoma</i>		Marshall, 98.8.....	Apr. 23, 1959
Thomasville, 96.3.....	June 24, 1958	Lawton, 99.5.....		Palestine, 99.79.....	July 10, 1959
Toccoa, 97.4.....	Dec. 19, 1958	<i>Oregon</i>		Waco, 99.97.....	Sept. 25, 1959
Washington, 99.87.....	Feb. 25, 1959	Portland, 99.9.....		<i>Virginia</i>	
<i>Kentucky</i>		<i>Tennessee</i>		Charlottesville, 99.7.....	
Madisonville and Hopkins County, 99.....	Dec. 11, 1958	Harriman, 95.....		<i>Washington</i>	
Somerset and Pulaski County, 96.....	Aug. 29, 1958	Kingston, 96.5.....		Benton and Franklin Counties, 99.7.....	
<i>Mississippi</i>		<i>Texas</i>		Seattle-King County, 99.7.....	
Gulfport, 99.....	Mar. 27, 1958	Abilene, 99.67.....		<i>West Virginia</i>	
<i>Missouri</i>		Austin, 99.9.....		Kanawha County, 99.3.....	
Joplin, 91.4.....	Feb. 5, 1958				

NOTE: In these communities the pasteurized market milk shows a 90 percent or more compliance with the grade A pasteurized milk requirements, and the raw market milk shows a 90 percent or more compliance with the grade A raw milk re-

quirements, of the milk ordinance recommended by the U.S. Public Health Service.

Notice particularly the percentage of the milk pasteurized in the various communities listed. This

percentage is an important factor to consider in estimating the safety of a city's milk supply. All milk should be pasteurized, whether commercially or at home, before it is consumed.

# Federal Publications

**Little Strokes. Hope through research.** *PHS Publication No. 689; 1959; 16 pages; 10 cents, \$7.50 per 100.*

Symptoms of little strokes are described and the importance of early professional diagnosis and treatment is emphasized through personalized examples.

Research in prevention and treatment of stroke is interpreted in terms of the program at the National Institute of Neurological Diseases and Blindness and elsewhere. Discussions of experimental strokes in animals, movement of body fluids, narrowing of human blood vessels, use of anticoagulants, and problems of nomenclature are included.

Medical, paramedical, and social workers will find this booklet helpful for students in their respective fields and for stroke patients and their families.

**A Digest of State Air Pollution Laws.** *PHS Publication No. 711; 1959; by Samuel M. Rogers and Sidney Edelman; 117 pages; 75 cents.*

Significant provisions of State statutes together with a general statement about each act, the organization provided to administer the act, administrative procedures, and penalty or violation provisions are presented.

This digest is intended for use in the examination and evaluation of existing and proposed legislation and in the formulation of new laws. It will be revised from time to time to keep it current with new legislation.

**An Industrial Waste Guide to the Cotton Textile Industry.** *PHS Publication No. 677; 1959; 23 pages; 25 cents.*

This guide is intended primarily to assist the operators and managers of cotton textile processing plants to use, reduce, and otherwise suitably dispose of their waste waters. It is also designed to inform personnel of regulatory agencies of the sources

and pollutional characteristics of cotton textile wastes and the status of developments in waste treatment.

The fifth in a series, the guide was prepared by the National Stream Sanitation Committee of the American Association of Textile Chemists and Colorists and published by the Public Health Service as a part of the joint government-industry program to reduce water pollution through control of industrial wastes.

**Coronary Artery Disease.** *PHS Publication No. 145 (Health Information Series No. 68); revised 1959; leaflet; 5 cents, \$2.75 per 100.* Written for the layman. Discusses processes leading to coronary artery disease, latest methods of treatment, and outlook for coronary patients.

**Serology Evaluation and Research Assembly, 1956-57.** *PHS Publication No. 650; 1959; 214 pages; \$1.25.*

This official report of an evaluation of serologic tests for syphilis, conducted by the Public Health Service through the cooperation of 15 laboratories, includes a comparative analysis of the performance of 13 *Treponema pallidum*, 7 Reiter treponeme, and 18 nontreponemal antigen techniques in testing 1,298 specimens representing 10 syphilitic and nonsyphilitic categories.

Other sections are devoted to the method of study, results reported, summary of results (by category), sensitivity and specificity of individual tests, and comments and conclusions.

**Physicians for a Growing America. Report of the Surgeon General's Consultant Group on Medical Education.** *PHS Publication No. 709; 1959; 95 pages; 60 cents.*

Fulfilling the increasing need for physicians is considered in relation to number of applicants to medical schools, quality of students, deterrents to medical education, and sources of student support. A dis-

cussion of medical schools emphasizes financing and expansion.

Broad recommendations are offered for action by the schools themselves, other educational institutions, the medical profession, the public, business and philanthropy, the States, and the Federal Government. The need for development of medical educational opportunities in areas now without adequate facilities is stressed.

**Rheumatic Heart Disease.** *PHS Publication No. 144 (Health Information Series No. 67); revised 1959; leaflet; 5 cents, \$2.75 per 100.* Re-counts the process by which rheumatic fever damages heart valves. Describes the disease's relation to streptococcal infections, its symptoms, and treatment. Stresses importance of prevention.

**Animal Ringworm in Public Health.** *PHS Publication No. 727; 1960; 61 pages; 35 cents.*

Clinical and epidemiological aspects of ringworm in animals are discussed with emphasis on the mode of transmission to man and the public health importance of these infections. A review of recent surveys of animal ringworm indicates the extent of the problem and the fungus species involved.

Practical methods for the diagnosis of ringworm in animals, including methods for collection of clinical materials and laboratory procedures, are described in detail.

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This section carries announcements of new publications prepared by the Public Health Service and of selected publications prepared with Federal support.

Unless otherwise indicated, publications for which prices are quoted are for sale by the Superintendent of Documents, U.S. Government Printing Office, Washington 25, D.C. Orders should be accompanied by cash, check, or money order and should fully identify the publication. Public Health Service publications which do not carry price quotations, as well as single sample copies of those for which prices are shown, can be obtained without charge from the Public Inquiries Branch, Office of Information, Public Health Service, Washington 25, D.C.

The Public Health Service does not supply publications other than its own.

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# ECHOES

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Health

Reports

## INFLUENZA-PNEUMONIA MORTALITY IN A GROUP OF ABOUT 95 CITIES IN THE UNITED STATES, 1920-1929

By SELWYN D. COLLINS, Associate Statistician, United States Public Health Service

Since the influenza pandemic of 1918-19 there have occurred at various times in the United States, as elsewhere, prominent epidemics of respiratory diseases. It is not the purpose of this report to enter into any discussion of the etiological relationship between these several epidemics nor to attempt any definition of the features which serve to identify an influenza epidemic. What is undertaken is to study the course of the recorded mortality from certain respiratory diseases week by week in a large group of cities of the United States; to identify from this record the more distinct periods of notably excessive mortality; to measure the excess, as well as may be; to study its distribution in various sections of the United States in each period; and to study the indicated movement of these epidemics from one part of the country to another.

However objective an approach one may wish to make in the study of the phenomena, the fact that the epidemic manifestations are ordinarily recorded as "influenza" in morbidity statistics and "influenza" and "pneumonia" in mortality statistics carries with it an implication that these manifestations were epidemic influenza. In other words, we have been accustomed to call these respiratory epidemics by a single name—"influenza." It may be that this is a correct interpretation. On the other hand, it may be argued that

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Dr. Selwyn D. Collins' work on excess mortality from influenza and pneumonia forms a benchmark for current investigations of influenza. His study of trends and epidemics, extending finally through 1956, used weekly death rates which exceeded the normal seasonal expectancy for these diseases as an approximation of excess mortality in any given week.

Public Health Reports

U. S. GOVERNMENT PRINTING OFFICE: 1930

# Children with Congenital Heart Disease Served in Regional Centers, 1952-56

ALICE D. CHENOWETH, M.D., and SADIE SAFFIAN, M.A.

**R**EGIONAL centers for evaluation and treatment of congenital heart disease in children were initiated by the Children's Bureau at a time when such care was available in few States. The regional centers were planned to augment services under State crippled children's programs.

Though relatively small in total numbers, one of the most rapidly growing services to crippled children is the congenital heart disease program. The number of children receiving physicians' service in 1957 was almost five times the number in 1950, increasing from 2,207 to 10,168 (fig. 1). In 1958, 12,164 children with congenital malformations of the circulatory system were served. Why has this happened?

In 1939, Congress increased the appropriation for crippled children's programs with the understanding that part of these funds would be used by the States to develop services for children with rheumatic heart disease. Few data on the number of children with congenital heart disease in crippled children's programs are available for the decade 1940 to 1950, but reports which we do have suggest that the number was increasing. As could be expected, among the children referred for suspected rheumatic heart disease were children with congenital heart defects.

In 1939, the same year the appropriation was increased for crippled children, Gross (1) re-

ported the first successful surgical treatment of a patient with patent ductus arteriosus. In 1945, Gross (2) and also Crafoord (3) published reports of the correction by surgery of coarctation of the aorta. At about the same time, Blalock and Taussig (4) reported the results of surgical treatment of pulmonary stenosis and pulmonary atresia; Potts' modification (5) came in 1946. Also in 1945, Gross (6) first reported the surgical treatment of congenital vascular ring (double aortic arch). In 1948, Brock (7) reported the feasibility of a direct surgical attack on congenital pulmonary stenosis.

Thus within a 10-year period, tremendous advances were made in the surgical correction of congenital malformations of the circulatory system, chiefly by surgery on blood vessels. Significantly, an early beginning of intracardiac surgery by Brock (7) foreshadowed the brilliant successes which were to follow. Prior to and concurrent with these advances in surgery, diagnostic skills and techniques were being developed and knowledge of physiology and the dynamics of the circulation was being advanced.

Guided by the principle that these surgical advances should be translated into benefits for children, State agencies for crippled children began to arrange care for those children whose defects were amenable to treatment by the procedures then available. A State having a medical center equipped for adequate diagnosis and surgery was frequently called upon to arrange care by other States without such a facility. This was difficult administratively and at times impossible if the State making the request had

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legal prohibitions against paying for out-of-State care. Appeals to the Children's Bureau for help came from both States and parents.

Because of the publicity given the announcement of the Blalock-Taussig operation, children from all over the world came to the Johns Hopkins Hospital for cardiac evaluation and treatment. The problem of their care became so acute that the hospital sought the assistance of the Maryland State Department of Health, which in turn approached the Children's Bureau. Therefore, in January 1949, the Children's Bureau approved a special B grant to Maryland for services to out-of-State children with congenital heart disease. This grant, which antedated the establishment of regional congenital heart centers, has continued ever since. In March 1950, the Technical Advisory Committee on Programs for the Care of Children with Rheumatic Fever and Heart Disease to the Children's Bureau recommended that every effort be made to provide diagnostic and treatment services to children with congenital heart disease.

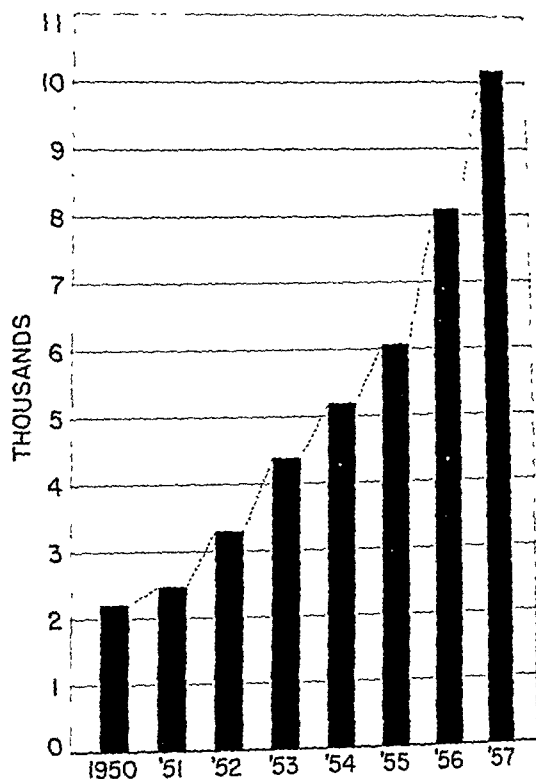
As a consequence of these developments, beginning in July 1951, the Children's Bureau set aside annually \$100,000 of reserve fund B for support of regional congenital heart centers. Medical centers which were outstanding and had a record of successful cardiac surgery were to be designated as regional centers provided: the capacity of the center was such that an additional number of children could be served there; the location of the center was such that it would easily serve adjoining States; and the crippled children's agency in the State was willing and able to administer a regional program. Treatment centers were to be located throughout the country in such a way as to provide full geographic coverage.

Five States are now administering regional congenital heart programs. They are: Maryland, Illinois, Minnesota, Texas, and California.

### Administration

Though there are some differences, the pattern of administration of the five regional congenital heart centers is much the same. In effect, the crippled children's agency of the State where the medical center is located acts

Figure 1. Children with congenital heart disease served in the crippled children's program, 1950-57



as the agent, and takes responsibility for arranging the kinds of services needed by children referred by other State agencies, including financial arrangements. It also acts as a liaison between the regional center and the referring State.

In general, the States send their cases to the most adjacent center. However, the skill and reputation of the physicians at a particular center, as well as the preferences of the State agency, the child's private physician, and the parents, also determine the selection.

As in other official crippled children's programs, any child under 21 years of age is eligible for service.

Most cases treated by the regional centers are known to the crippled children's agency of the referring State and complete records are sent to the agency of the State where the center is located. Not only is medical data transmitted, namely, provisional diagnosis, history, physical examination, X-ray and laboratory data, but

identifying, social, and financial data as well. Wherever possible, the referring agency works out in advance a complete plan for the child and for at least one parent who must accompany him. This plan includes transportation of child and parent, and arrangements for board and lodging of the parent while the child is at the center. It indicates what payments, if any, parents, voluntary agencies, health insurance, and the referring State agency are prepared to make toward the cost of treatment. Eligibility for acceptance under the regional program is determined by the referring State, medical need being the primary consideration. Determination of financial need is based on a review of such information as cost of care, family income, size of family, outstanding financial obligations, and availability of health insurance. Because of the high cost of cardiovascular surgery, a relatively larger proportion of families are in need of at least partial assistance in the congenital heart program.

The prime objective of the regional heart program is to correct congenital cardiovascular defects. Therefore, after review of available medical data, those children whose conditions are presumed to be operable are selected by the center's staff. Before proper treatment can be planned for a child, however, his exact malformation and cardiac function must be determined; this may require extensive studies at the center. Even if an operation is not advised, referred children are the responsibility of the regional program as long as they remain at the center. If inoperable when first seen, the child is placed on a proper medical regimen and the center keeps a record of the child and his defect so that he can be recalled if later advances in surgical treatment offer an opportunity to improve his condition. Intercurrent illnesses which develop during the stay of the patient at the center may also be covered by funds for the regional heart program.

In general, transportation of parent and child to the center and board and room for parent and child are the responsibility of the referring State agency; inpatient hospital care, including medical consultations, special nursing care, and blood, is the responsibility of the State agency administering the regional heart program. In some cases diagnostic studies, if done on an out-

patient basis at the center, are paid for by the referring State. Convalescent care, if needed, may or may not be paid from regional program funds.

As a basis for future planning for the care of children with congenital heart disease, the Children's Bureau needed information regarding the use which was being made of regional centers. Therefore, in 1952 an individual record form was adopted. It was designed to show disposition of each application and to present some key facts about each child, such as diagnosis, types of care provided and their costs, and the results of treatment. Regional centers began submitting case summaries in 1952; at the end of 1956, individual records were discontinued and an annual summary report substituted. During this period more than 934 different children received services under the regional congenital heart center program. Omitted from this analysis are a very few cases seen in one center which accepted children for only a short period and from which there is incomplete reporting. Also omitted is an unknown number of cases from another center which failed to send in reports for 1956. Together, these omissions are not a substantial number. This analysis, therefore, covers the cardiac treatment of 934 children under the

**Table 1. Children referred to regional congenital heart centers, by number and by referring State, 1952-56**

Number of children	Number of States	States
Total.	43	
Less than 5.	19	California, Illinois, Iowa, Kansas, Kentucky, Louisiana, Massachusetts, Minnesota, Mississippi, Montana, New Jersey, New York, Ohio, Oklahoma, Puerto Rico, South Carolina, Washington, Wyoming, Canal Zone.
5-9.....	5	Arkansas, District of Columbia, Georgia, Tennessee, Virginia.
10-19.....	9	Alaska, Delaware, Florida, Hawaii, Indiana, Michigan, North Carolina, Pennsylvania, Wisconsin.
20-29.....	2	Missouri, Nebraska.
30 and over.	8	Arizona, Idaho, Maryland, Nevada, New Mexico, North Dakota, South Dakota, Texas.



**Table 2. Sex and color of children served by the regional congenital heart program, 1952-56**

Sex and color	Number	Percent <sup>1</sup>
Total.....	934	100. 0
Sex:		
Male.....	429	46. 0
Female.....	503	54. 0
Unreported.....	2	
Color:		
White.....	822	89. 3
Other.....	99	10. 7
Unreported.....	13	

<sup>1</sup> Based on total, excluding unreported.

regional congenital heart program during the 5 years 1952 through 1956.

The regional congenital heart plan was conceived as a program to supplement, or in some cases to fill gaps in services, but not to supplant the services of State crippled children's agencies. Also, it was regarded as a temporary plan which would not be needed after adequate treatment facilities became available in all States. That it has been a relatively small part of the total crippled children's program for children with congenital heart disease is borne out by the fact that in 1957 the 686 children who received services in the regional centers represented less than 7 percent of the children with

congenital heart disease who received physicians' services in official State crippled children's programs.

### Findings

Table 1 shows the States which referred children to the regional centers for the period 1952-56. States with fewer facilities such as Nevada, New Mexico, Arizona, North Dakota, and South Dakota referred relatively larger numbers of children to the regional centers than States such as California, New York, Illinois, and Massachusetts which had their own treatment facilities.

Fifty-four percent of the children seen under the program were girls. In one center the proportion of girls was almost as high as 59 percent. The children were 89.3 percent white and 10.7 percent nonwhite (table 2). This percentage is lower than the proportion of nonwhite to white children in the total population (13 percent), or in the entire crippled children's program (16 percent) in 1956.

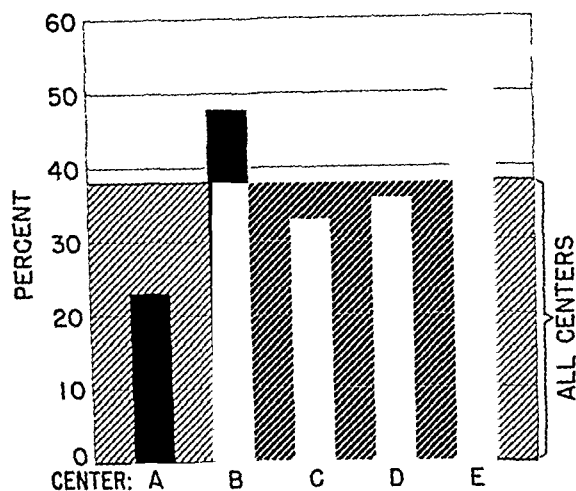
Table 3 shows the ages of the children when they were first brought to the centers. The majority were seen before the age of 5 years. The largest number for any one year of age was seen in their first year of life, the second largest number in their second year of life.

**Table 3. Children receiving and not receiving surgery under the regional congenital heart program, by age, 1952-56 <sup>1</sup>**

Age (years)	Number			Percentage distribution by age			Percentage distribution for each age group		
	Total	Surgery	No surgery	Total	Surgery	No surgery	Total	Surgery	No surgery
Total .....	934	354	578	100. 0	100. 0	100. 0	100. 0	38. 0	62. 0
Under 5.....	470	163	306	50. 3	46. 0	52. 9	100. 0	34. 8	65. 2
Under 1.....	150	40	110	16. 1	11. 3	19. 0	100. 0	26. 7	73. 3
1.....	107	34	73	11. 5	9. 6	12. 6	100. 0	31. 8	68. 2
2.....	79	33	45	8. 4	9. 3	7. 8	100. 0	42. 3	57. 7
3.....	57	22	35	6. 1	6. 2	6. 1	100. 0	38. 6	61. 4
4.....	77	34	43	8. 2	9. 6	7. 4	100. 0	44. 2	55. 8
5-9.....	258	107	151	27. 6	30. 2	26. 1	100. 0	41. 5	58. 5
10-14.....	137	62	74	14. 7	17. 5	12. 8	100. 0	45. 6	54. 4
15-19.....	54	19	35	5. 8	5. 4	6. 1	100. 0	35. 2	64. 8
20.....	6	2	4	. 6	. 6	. 7	(?)	(?)	(?)
Unreported.....	9	1	8	1. 0	. 3	1. 4	(?)	(?)	(?)

<sup>1</sup> Two children excluded. No determination available on whether or not they received surgery.  
<sup>2</sup> Not computed. Base too small.

**Figure 2. Percentage of children served at five centers who received surgery under the regional congenital heart program, 1952-56**



In the first 3 years of life, the percentage of children who received surgery increased progressively from about 27 percent under 1 year to approximately 32 percent at 1 year and 42 percent at 2 years. At ages 9 and 10 more than one-half of the children received surgery.

Only about 38 percent of the children in the five regional centers received surgical treatment under the regional heart program during the 5-year period 1952-56 (fig. 2). Some children had surgery before 1952, after 1956, under private auspices, or under a State program, and thus their operations were not counted in this study. During this period, however, a number of children were operated on more than once but were counted as one surgical case, for

example, repair of patent ductus followed later by correction of coarctation of the aorta, and a few children had more than one shunting operation, sometimes each of a different type. In addition, a very few children had noncardiac surgery, which was also excluded from this count.

Comparison of the percentage of cases treated surgically at the different regional centers showed variation from 51 percent to 23 percent.

Some of the more common reasons why surgery was not performed were: inoperable defect at this time; essentially correctable condition, return later after more experience has been gained; await open heart surgery; postpone till child is older; defect slight, present disability does not justify the risk of surgery; death of child before date set for surgery; presence of other severe handicaps more disabling than the heart defect; presence of intercurrent infections, especially respiratory infections and measles.

Sometimes parents refused to permit an operation on their child. Some of their reasons for refusal included: probable benefit would not justify risk; change of residence, request for transfer to another center; and diagnostic studies or intercurrent illness delayed operation so long that parents had to return home because of family duties or because father had to return to his job.

In some cases the surgical schedule was so crowded that an appointment could not be given until a later date. In 1957, operation on a large number of cases ready for surgery had

**Table 4. Condition of children at discharge who received surgery and no surgery under the regional congenital heart program, 1952-56**

Condition at discharge <sup>1</sup>	Number				Percent <sup>2</sup>	
	Total	Surgery	No surgery	Unknown	Surgery	No surgery
Total.....	934	354	578	2	100.0	100.0
Good.....	342	225	116	1	64.7	20.7
Fair.....	148	43	105	0	12.4	18.7
Unimproved.....	342	31	310	1	8.9	55.4
Died.....	78	49	29	0	14.1	5.2
Unreported.....	24	6	18	0		

<sup>1</sup> Time of discharge means the last time a child was seen in a regional center.

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1-----	107	34	73	11. 5	9. 6	12. 6	100. 0	31. 8	68. 2
2-----	79	33	45	8. 4	9. 3	7. 8	100. 0	42. 3	57. 7
3-----	57	22	35	6. 1	6. 2	6. 1	100. 0	38. 6	61. 4
4-----	77	34	43	8. 2	9. 6	7. 4	100. 0	44. 2	55. 8
5-9-----	258	107	151	27. 6	30. 2	26. 1	100. 0	41. 5	58. 5
10-14-----	137	62	74	14. 7	17. 5	12. 8	100. 0	45. 6	54. 4
15-19-----	54	19	35	5. 8	5. 4	6. 1	100. 0	35. 2	64. 8
20-----	6	2	4	. 6	. 6	. 7	( <sup>2</sup> )	( <sup>2</sup> )	( <sup>2</sup> )
Unreported-----	9	1	8	1. 0	. 3	1. 4	( <sup>2</sup> )	( <sup>2</sup> )	( <sup>2</sup> )

<sup>1</sup> Two children excluded. No determination available on whether or not they received surgery.

<sup>2</sup> Not computed. Base too small.

singly and with 1 exception occurred more frequently alone than in combination.

The three most frequent malformations by far were: ventricular septal defect which occurred 181 times, alone in 135 children and associated with another cardiovascular defect in 46 children; patent ductus arteriosus, 177 times, alone in 147 children and in combination with other defects in 30 children; and tetralogy of Fallot, 170 times, alone in 164 children and combined with an additional defect in 6 children. More than half of the children who were seen at the regional centers had one of these three defects.

Following in importance according to frequency were: pulmonary stenosis, atrial septal defect, and coarctation of the aorta, transposition of great vessels, aortic stenosis, truncus arteriosus, and tricuspid atresia.

In 57 cases of congenital heart disease, the exact defect was undetermined. In all of these, further diagnostic studies were indicated; in some, the malformations were so complex that even with extensive studies an exact diagnosis was not possible. In a few cases diagnostic studies were not completed for a variety of reasons, such as child's condition became critical during catheterization, was too serious to permit extensive studies, or was so mild that it was deemed inadvisable to risk further studies.

In 21 children the diagnosis was rheumatic heart disease; 1 of these, a 14½-year-old girl, was operated on for relief of "far-advanced mitral stenosis."

Five cases of heart disease were classified as neither congenital nor rheumatic, for example, one case of tuberculous pericarditis with effusion and one of toxic myocarditis.

In 29 children no heart disease was found, 24 probably had functional murmurs and no other pathology, 2 had mediastinal tumors, 1 an enlarged thymus, 1 a nutritional anemia with hemic murmur, and 1 had pleuropericardial adhesion with distortion of pericardium and cardiac displacement with no evidence of cardiovascular disease.

We think it is fair to say that usually the most difficult cases are sent to the regional centers. One has only to review the protocols of children treated in the regional centers to realize what complex defects some of them had,

how desperately ill some of them were on arrival, and what unpredictable and severe complications a few of them developed. The individual record form asked for "other conditions." Probably this item was under-reported.

Twenty-nine children had associated congenital malformations. Included in this group were two cases of mongolism and one other case of mental retardation with a rectal stricture. Excluded were four other cases of mental retardation from unknown cause. Five of these 29 children had multiple congenital deformities. Four had cleft palate; four had situs inversus of abdominal organs; and three had congenital cataracts. One of the children with congenital cataracts also had a hearing loss; it was stated that the mother had German measles in the first trimester.

Twenty-seven serious infections were reported. Five children had subacute bacterial endocarditis (three of the five were cases of tetralogy of Fallot). Reflecting the improved therapy of this condition, none died at the centers and two were reported in "good" condition. Three children had brain abscesses; three children had tuberculosis, one of these had tuberculous pericarditis. Pneumonia was a complication in four cases.

Nineteen children had neurological complications. The seven cases of mental retardation and the three cases of brain abscess have been previously mentioned. Two cases of cerebral palsy were treated for congenital heart disease. One postoperative case of tetralogy of Fallot developed cerebral thrombosis with residual hemiplegia; a 3-month-old infant with transposition of great vessels had a massive bilateral cerebral hemorrhage. One child with coarctation of the aorta and patent ductus had postoperative paraplegia.

### Conclusion

Tribute is due the State crippled children's agencies which administer these regional programs. It was a sizable task to submit the records on which this analysis is based. The administration of this program has not been easy, partly because there were patients who did not apply through their home State crippled children's agency. For example, there were emergency cases or destitute families who

to be postponed because funds for the regional congenital heart program were depleted. In 1958, funds were again inadequate.

For those children receiving surgery, nearly two-thirds were described as being in good condition at the time of discharge from the center (table 4). Mortality in surgically treated cases was 14 percent, in nonsurgical 5 percent. A followup study to learn how many children died following their return home and how many continued to do well would be of great value. Some of the children who died without surgery had extremely complex defects, a few were admitted in extremis, and eight died in heart failure. Of those children who did not receive surgery, more than half were unimproved; in contrast, only 9 percent of the surgically treated cases were unimproved. Though a few cases received open heart surgery in 1956, for the most part the period covered by this analysis preceded the open heart era.

Forty of the patients receiving surgery were under 12 months of age upon admission. Nearly half (18) died. Twelve of the deaths were among the 23 infants under 6 months of age. The condition of the infants receiving surgery under the program at discharge was as follows:

Condition at discharge	Age (months)	
	Under 6	6-12
Good -----	7	7
Fair -----	3	2
Unimproved -----	1	2
Died -----	12	6
Total -----	23	17

There were only two cases of patent ductus among these infants, both of whom did well. The three most frequent diagnoses among them were: tetralogy of Fallot (11), tricuspid atresia (6), and transposition of great vessels (4).

Table 5 shows the days of hospitalization for the children receiving surgery; in some instances they represent two or more periods of inpatient care. Nearly half of the cases were hospitalized between 1 and 2 weeks, a quarter were in the hospital between 2 and 3 weeks, one-eighth between 1 and 3 months, and 3 cases as long as 3 months or more.

Table 6 summarizes the diagnostic data as re-

ported by the regional centers. In many cases detailed medical notes copied from the hospital records give supplementary information about the condition of the child and his treatment during his stay at the center in addition to diagnosis. As one might anticipate, a definitive diagnosis had not been established as yet in every case; in slightly more than one-tenth of the cases the diagnosis was reported as probable or questionable.

Tabulation of the medical data presented some difficulty because of variations in reporting diagnostic information. Also, some children had not only complex cardiovascular defects to which no one diagnostic label could be applied, but also other concurrent conditions as well. It was decided in this presentation to give priority to the cardiovascular anomaly (if present) even though other more serious conditions coexisted.

The first 15 diagnoses listed in table 6 occurred in combination with another defect. Thirteen other children had even more complex defects, namely three or more congenital cardiovascular anomalies occurring simultaneously. These were listed under "miscellaneous congenital heart conditions—complex conditions." In each of these children, there was a different combination of defects. Eight of these children died.

Although the first 15 diagnoses, listed in descending order of frequency, occurred in combination, the first 11 of them also occurred

**Table 5. Number of days of hospitalization of children having surgery under the regional congenital heart program, 1952-56**

Days of hospitalization	Children who received surgery	
	Number	Percent <sup>1</sup>
Total -----	354	100.0
Under 7 -----	19	5.4
7-14 -----	169	48.3
15-21 -----	87	24.9
22-28 -----	27	7.7
29-89 -----	45	12.9
90 and over -----	3	0.8
Unreported -----	4	---

<sup>1</sup> Based on total, excluding unreported.

Diagnoses <sup>1</sup>	Children with reported diagnoses (unduplicated count)		Number of diagnoses re-reported <sup>2</sup>
	Number	Per cent	
Double aortic arch.....	(—)	-----	1
In conjunction with tetralogy of Fallot.....	(3)	-----	1
Biloculate heart.....	(—)	-----	1
In conjunction with truncus arteriosus.....	(3)	-----	1
Tricuspid atresia.....	20	2.1	20
Endocardial fibroelastosis.....	13	1.4	13
Eisenmenger complex.....	9	1.0	9
Atrioventricular communis.....	6	.6	6
Ostium primum.....	3	.3	3
Taussig-Bing heart.....	3	.3	3
Miscellaneous congenital heart conditions <sup>4</sup> .....	(23)	-----	23
Complex conditions.....	13	1.4	13
All other.....	10	1.1	10
Congenital heart disease, type undetermined.....	57	6.1	57
Rheumatic heart disease.....	21	2.2	21
Heart disease, other than congenital or rheumatic.....	5	.5	5
No heart disease.....	24	2.6	24
Other than heart disease.....	5	.5	5

<sup>1</sup> In general, the arrangement of diagnoses is according to incidence.

<sup>2</sup> The count in this column is by individual diagnoses whether occurring singly or in dual combinations. Any combination of three or more diagnoses is counted once, due in part to difficulties in determining satisfactorily the exact number of conditions. This slight undercount probably does not affect the total number of diagnoses significantly.

<sup>3</sup> No entry is made here because this combination of diagnoses is shown above in reverse order.

<sup>4</sup> Included are multiple diagnoses of three or more conditions, and certain other cardiovascular conditions infrequently reported.

arrived at the center without an appointment, so-called "door-step cases," or cases known only to the center hospital which was unaware of the inadequacy of family resources before admission of the patient, or those children whose parents appealed directly to the President, their Congressman, or the Children's Bureau.

Perhaps the most serious problem has been the inadequacy of funds to meet the demand for service. It was predicted when the regional congenital heart program was launched that the amount of money available to it would probably be too small to meet the demand for services. It was estimated at that time that the average cost per case for diagnostic, surgical, hospital, and related services would be in the neighborhood of \$1,000 which, if approximately correct, meant the amount appropriated would permit complete treatment service for only 100 children per year in the regional centers. The prediction that funds would be inadequate has been borne out with experience. In fiscal year 1958 the Children's Bureau increased the allotment to regional heart centers to \$248,270; in fiscal year 1959, to \$330,000. Both years the demand for services greatly exceeded the amount of funds available so that before the first half-year was over, centers had to refuse services to children unless the home State could pay the total cost of their care.

None of the crippled children's programs which States administer is static, but the unusually rapid advances in the treatment of congenital heart disease have made administration especially difficult. In spite of expenditure of time and effort in trying to arrive at average cost, no figure which is entirely satisfactory has been found. The problem is not only that costs for comparable services are rising, but with rapid advances in the treatment of defects of different types and increasing complexity, more and more complicated diagnostic and treatment procedures are required. Certain generalizations about costs can be made, however. Cost of hospitalization exceeds all other costs as a major item of expense; costs rise as complexity of defect or of corrective surgery increases.

In reviewing the records, occasional mention of health insurance was noted; it was probably under-reported. In about 13 percent of all cases, there was evidence that the family had some type of insurance which paid part of the bill. About one-fifth of the surgical cases, or a higher proportion than the nonsurgical, had some insurance.

We have ignored the human side of the program in this analysis. The anxiety which con-

Table 6. Diagnoses of children served by the regional congenital

Diagnoses <sup>1</sup>	Children with reported diagnoses (unduplicated count)		Number of diagnoses reported <sup>2</sup>	Diagnoses <sup>1</sup>	Children with reported diagnoses (unduplicated count)		Number of diagnoses reported <sup>2</sup>
	Number	Percent			Number	Percent	
Total.....	934	100.0	1,035	Coarctation of aorta.....	(42)		55
Ventricular septal defect.....	(181)		181	Alone.....	35	3.7	35
Alone.....	135	14.5	135	In conjunction with:			
Patent ductus arteriosus.....	11	1.2	11	Patent ductus arteriosus.....	(3)		9
Atrial septal defect.....	6	.6	6	Ventricular septal defect.....	(3)		2
Coarctation of aorta.....	2	.2	2	Atrial septal defect.....	(3)		2
Pulmonary stenosis.....	22	2.4	22	Transposition of great vessels.....	1	.1	1
Transposition of great vessels.....	3	.3	3	Mitral stenosis.....	1	.1	1
Aortic stenosis.....	2	.2	2	Aortic stenosis.....	3	.3	3
Patent ductus arteriosus.....	(166)		177	Single ventricle.....	1	.1	1
Alone.....	147	15.7	147	Aneurysm.....	1	.1	1
In conjunction with:				Transposition of great vessels.....	(28)		33
Tetralogy of Fallot.....	2	.2	2	Alone.....	26	2.8	26
Ventricular septal defect.....	(3)		11	In conjunction with:			
Atrial septal defect.....	3	.3	3	Ventricular septal defect.....	(3)		3
Coarctation of aorta.....	9	1.0	9	Atrial septal defect.....	(3)		1
Pulmonary stenosis.....	2	.2	2	Coarctation of aorta.....	(3)		1
Aortic stenosis.....	3	.3	3	Single ventricle.....	2	.2	2
Tetralogy of Fallot.....	(168)		170	Aortic stenosis.....	(19)		27
Alone.....	164	17.6	164	Alone.....	19	2.0	19
In conjunction with:				In conjunction with:			
Patent ductus arteriosus.....	(3)		2	Patent ductus arteriosus.....	(3)		3
Atrial septal defect.....	2	.2	2	Ventricular septal defect.....	(3)		2
Aneurysm.....	1	.1	1	Coarctation of aorta.....	(3)		3
Double aortic arch.....	1	.1	1	Truncus arteriosus.....	(20)		20
Pulmonary stenosis.....	(65)		89	Alone.....	19	2.0	19
Alone.....	53	5.7	53	In conjunction with bi-loculate heart.....	1	.1	1
In conjunction with:				Single ventricle.....	(3)		9
Patent ductus arteriosus.....	(3)		2	Alone.....	3	.3	3
Ventricular septal defect.....	(3)		22	In conjunction with:			
Atrial septal defect.....	9	1.0	9	Coarctation of aorta.....	(3)		1
Single ventricle.....	3	.3	3	Pulmonary stenosis.....	(3)		3
Atrial septal defect.....	(49)		69	Transposition of great vessels.....	(3)		2
Alone.....	39	4.2	39	Mitral stenosis.....	(4)		6
In conjunction with:				Alone.....	4	.4	4
Tetralogy of Fallot.....	(3)		2	In conjunction with:			
Patent ductus arteriosus.....	(3)		3	Atrial septal defect.....	(3)		1
Ventricular septal defect.....	(3)		6	Coarctation of aorta.....	(3)		1
Coarctation of aorta.....	2	.2	2	Anomalous vessels.....	(—)		6
Pulmonary stenosis.....	(3)		9	In conjunction with atrial septal defect.....	(3)		6
Transposition of great vessels.....	1	.1	1	Aneurysm.....	(—)		2
Mitral stenosis.....	1	.1	1	In conjunction with:			
Anomalous vessels.....	6	.6	6	Tetralogy of Fallot.....	(3)		1
				Coarctation of aorta.....	(3)		1

# DDT Resistance in *A. Quadrimaculatus*

WILLIS MATHIS, B.S., JOHN W. KILPATRICK, M.S., M.P.H., and HARRY F. JOHNSON B.S.

**R**ESISTANCE to dieldrin in *Anopheles quadrimaculatus* Say has been demonstrated in Mississippi (1). Although this species showed a lowered susceptibility to BHC and chlordane, it was susceptible to DDT. Kruse and associates (2) reported possible DDT resistance in *A. quadrimaculatus* in the lakes of the Tennessee Valley Authority area, but subsequent studies (3) indicated this presumed resistance was due to other causes. Hawkins and associates (4) stated that DDT was still the insecticide of choice in the area, after 13 years of larvicidal applications. This paper describes the detection of a DDT-resistant population of *A. quadrimaculatus* which was recovered from a tributary of the Clark Hill Reservoir, Ga.

Clark Hill Reservoir is a multipurpose impoundment built and operated by the Corps of Engineers, U.S. Army, on the Savannah River approximately 22 miles north of Augusta, Ga. At maximum power (pool elevation 330 feet above mean sea level) it covers 70,000 acres with a shoreline of 1,060 miles. Impoundment began in 1951 and full pool was reached in May 1953. Average seasonal operating levels cover a range of about 12 feet.

## Operational Procedures

Following general recommendations of the Public Health Service regarding construction and project operation for mosquito control, the Corps of Engineers conducted pre- and post-impoundment anopheline density counts in conjunction with shoreline maintenance and a

larviciding program. Beginning in 1952, larvicide treatments were made by contract aircraft, at a rate of 0.08 to 0.20 pound of DDT per acre, to selected areas where weekly adult counts were high. The average number of *A. quadrimaculatus* per station inspection on the entire reservoir and the pounds of DDT applied during the period 1952 through 1959 are given in table 1. Extreme drought in 1954 and 1955 caused a total drawdown of 33.5 feet and failure to fill by about 10.5 feet in 1955, materially reducing the *A. quadrimaculatus* breeding potential during those years. The highest annual average of *A. quadrimaculatus* per station inspection for a single station has occurred each year since 1953 at a stable, station 41-A, adjacent to the Fishing Creek arm of the reservoir in Georgia. Table 2 gives the annual averages of *A. quadrimaculatus* per inspection for this station and the number of DDT treatments in that area per year.

In 1959, late filling of the reservoir (June 5 instead of May 1) and two floods, which caused rising pool elevations in July and September, resulted in high counts of *A. quadrimaculatus*

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genital heart disease produces in parents, their gratitude when a heavy financial burden is eased by the regional program, their relief and happiness when the surgeon tells them, "his heart is now normal, and he can gradually assume the activities of a normal child," is another story.

What of the future?

The chief cause of heart disease in childhood is now congenital heart disease (8). Hope for children with this condition improves daily as mortality from intracardiac surgery declines and the results continue to improve, also as new treatments are found to help children with more and ever more complex defects and as surgical treatment becomes possible even in the early months of life, when congenital heart disease is a particularly serious problem. Approximately three-fourths of all deaths due to congenital heart disease occur during the first year of life.

No matter how excellent treatment eventually becomes, our ultimate goal is the prevention of congenital heart disease. Though this goal seems far from fulfillment today, hopefully it may be attained in the not too distant future.

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## PHS Appointments

David E. Price, M.D., chief of the Bureau of State Services, Public Health Service, for the last 21½ years, has been named deputy director of the Service's National Institutes of Health, a position vacant since the retirement of Dr. Cassius J. Van Slyke in December 1959. This appointment and the following key staff changes become effective July 1, 1960.

Theodore J. Bauer, M.D., deputy chief of the Bureau of State Services since 1956, succeeds Dr. Price as bureau chief; and Kenneth M. Endicott, M.D., who has been associate director of the National Institutes of Health since 1959, will serve as director of the National Cancer Institute, succeeding Dr. John R. Heller, who will be on leave to serve as president of the Memorial Sloan-Kettering Cancer Center in New York City.

Robert L. Zobel, M.D., has been appointed medical officer in charge of the Indian Health Area Office

at Albuquerque, N. Mex. Since 1958, he has directed Indian health services in Idaho, Oregon, Washington, Montana, and Wyoming.

Dr. Price was first assigned to the National Institutes of Health in 1946, taking part in developing the research grants program. Associate director of extramural affairs at the institutes for 2 years, he was named Assistant Surgeon General in 1952, and in May 1957, deputy chief of the Bureau of Medical Services.

Dr. Bauer served as chief of the Venereal Disease Division from 1948 to 1953, when he was named chief of the Communicable Disease Center in Atlanta, Ga. Dr. Endicott was chief of the Cancer Chemotherapy National Service Center of the National Cancer Institute for 3½ years, after serving as scientific director of the Division of Research Grants from 1951 to 1955.

**Table 4. Percent mortality of field-collected female *A. quadrimaculatus* exposed to DDT-Risella oil papers for 2 or 4 hours**

Percent DDT	Exposure period (hours)	Number specimens	Percent mortality 24 hours after exposure
1-----	2	27	4
2-----	2	24	0
4-----	2	23	17
1-----	4	25	4
2-----	4	26	23
4-----	4	130	18
Check-----	4	24	4

only minimum mortality of the strain even with a 4-hour exposure period (table 4).

Additional tests with these field-collected specimens and with the Savannah laboratory strain were made at Savannah on September 24 with DDT- and dieldrin-treated papers. The data are given in tables 5 and 6.

To check the possible effect of season on the susceptibility level of field specimens, *A. quadrimaculatus* females were collected in the vicinity of Savannah, Ga., and exposed for 1 hour to 4 percent DDT-Risella oil-treated papers. The 50 specimens so tested gave a mortality of 96 percent, which is the normal response of a DDT-susceptible strain.

## Discussion

The preceding data establish that *A. quadrimaculatus* from the Clark Hill Reservoir area are resistant to DDT, both as larvae and adults. The lack of susceptibility data prior to insecticidal treatments does not permit the conclusion that the resistance was developed by the species through selection. However, the history of insecticidal treatment and the rising *A. quadrimaculatus* densities strongly suggest that this is the case.

This occurrence of DDT resistance in a field population of *A. quadrimaculatus* is of considerable significance in view of the fact that intensive efforts by workers of the Tennessee Valley Authority (4) and at the Technical Development Laboratories (5) to produce DDT-resistant strains by laboratory selection of adults or larvae, or both, have been un-

successful. The presence of DDT-resistant *A. quadrimaculatus* in the Clark Hill Reservoir area and the continued absence of DDT-resistant populations in other impoundments (for example, TVA) again emphasize the fact that the same species occurring in various localities may show distinct differences in its response to an insecticide. These differences could be inherent in the genetic makeup of the species or they could arise from variations in the environment.

From the data on dieldrin in tables 3 and 6, it is apparent that the species also is resistant to dieldrin, but the level is below that shown for DDT. The data on adults (table 6) show a definite plateau response to an increase in the concentration of dieldrin; a specific character-

**Table 5. Comparative susceptibility of Clark Hill Reservoir and Savannah laboratory strains of adult *A. quadrimaculatus* exposed to DDT-Risella oil-treated papers for 1 hour**

Percent DDT	Mortality at 24 hours			
	Clark Hill		Savannah	
	Number specimens	Percent	Number specimens	Percent
1-----	82	0	81	23
2-----	84	1	79	89
4-----	82	0	80	100
Check-----	20	5	20	0

**Table 6. Comparative susceptibility of Clark Hill Reservoir and Savannah laboratory strains of adult *A. quadrimaculatus* exposed to dieldrin-Risella oil-treated papers for 1 hour**

Percent dieldrin	Mortality at 24 hours			
	Clark Hill		Savannah	
	Number specimens	Percent	Number specimens	Percent
0.4-----	74	28	81	35
0.8-----	81	31	80	96
1.6-----	80	36	80	100
Check-----	20	0	19	0

in many parts of the reservoir. Despite regular applications of DDT larvicide, the weekly adult *A. quadrimaculatus* count at station 41-A was more than 300 specimens for 9 consecutive weeks beginning June 30. During the season the area was larvicided 18 times at approximately weekly intervals from May 7 to September 18.

In late July 1959, samples of DDT larvicides and solvents were submitted to the Technical Development Laboratories, Technology Branch, Communicable Disease Center, for testing their larvicidal action. These tests showed that the insecticide formulations as used in the control operations were fully effective against susceptible *A. quadrimaculatus* larvae. As a result, suspicion arose that the Clark Hill *A.*

**Table 1. Average number *A. quadrimaculatus* per station and pounds of DDT applied yearly, 1952 through 1959, Clark Hill Reservoir, Ga.**

Year	Average number <i>A. quadrimaculatus</i> per station	Pounds of DDT applied
1952-----	12.31	8,346
1953-----	4.43	5,698
1954-----	.85	4,276
1955-----	1.58	4,941
1956-----	3.34	7,635
1957-----	3.96	9,621
1958-----	2.46	10,605
1959-----	15.85	10,788

**Table 2. Average annual *A. quadrimaculatus* count, station 41-A, 1952 through 1959**

Year	Average number <i>A. quadrimaculatus</i> per inspection	Number of DDT treatments
1952-----	3.93	8
1953-----	24.40	16
1954-----	5.73	13
1955-----	13.73	16
1956-----	30.52	17
1957-----	29.50	17
1958-----	40.28	22
1959-----	200.00	18

<sup>1</sup> Exact average not determined. Nine inspections were reported as over 300.

**Table 3. Comparative susceptibility of third instar larvae of Clark Hill Reservoir and Savannah laboratory strains of *A. quadrimaculatus* to DDT-ethanol and dieldrin-ethanol solutions**

Concentration (ppm)	Percent mortality after 24-hour exposure			
	DDT		Dieldrin	
	Clark Hill <sup>1</sup>	Savannah <sup>2</sup>	Clark Hill	Savannah
0.004-----	2	36	19	100
0.02-----	8	100	29	100
0.1-----	2	100	38	100
0.5-----	16	100	86	100
2.5-----	49	100	100	100
Check-----	16	4	16	4

<sup>1</sup> Mortalities adjusted according to Abbott's formula.  
<sup>2</sup> Nonresistant laboratory strain.

*quadrimaculatus* might be resistant to DDT, and several hundred live adults were brought to the Technical Development Laboratories for testing.

#### Resistance Tests

The initial tests were run with larvae and adults obtained from eggs laid by field-collected specimens. The data obtained on third instar larvae, compared with results on larvae of the nonresistant Savannah laboratory strain, are given in table 3.

The number of available adults of the Clark Hill strain limited adult tests to the highest concentration of DDT- or dieldrin-Risella oil papers. One-hour exposures to 4 percent DDT-Risella oil paper and to 1.6 percent dieldrin-Risella oil paper gave only 4 and 38 percent kills, respectively. Adult mortalities for the Savannah laboratory strain at those dosages were 100 and 97 percent, respectively.

On September 21 and 22, adult specimens of *A. quadrimaculatus* were collected and tested in the field. Tests on September 21 at 1- and 2-hour exposures to papers impregnated with 1, 2, and 4 percent DDT in Risella oil indicated maximum mortalities of 34 percent, but the check mortality was unusually high (22 percent). On September 22, further tests showed that the maximum DDT concentration gave

# Recent Change in Infant Mortality Trend

IWAO M. MORIYAMA, Ph.D.

FOR MANY YEARS the rapid annual decline in infant mortality was noted with considerable satisfaction by health authorities. Because of this continuing decline, the increases in the infant mortality rate in 1957-58 have been viewed with some concern. No specific factors or disease outbreaks have been identified wholly to account for these rises in infant mortality.

At the request of the Children's Bureau, an examination of available information on infant mortality was made. It would appear from this study that there has been a basic change in the infant mortality trend beginning about 1949 or 1950. The events of the past few years served more to call attention to a problem which apparently had its genesis some years ago.

For years, the infant mortality rate declined at a rapid pace (fig. 1). During the period 1933-49, the infant mortality rate for all races decreased about 4.3 percent each year (slope computed by the method of least squares). However, beginning about 1950, the rate of decrease in infant mortality dropped to 2.0 percent per annum.

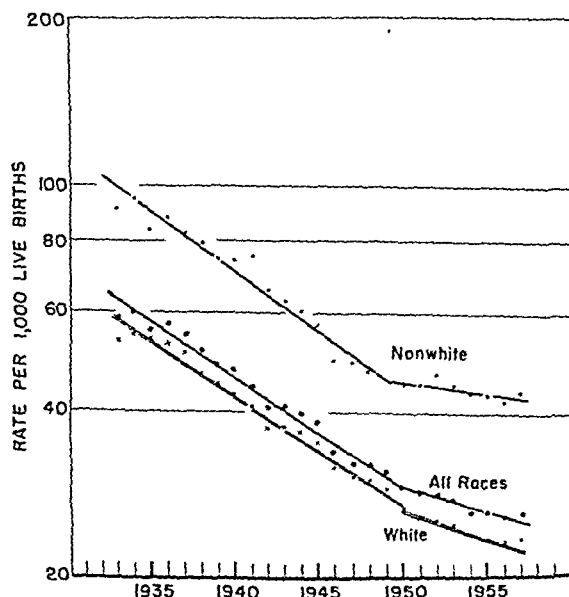
The mortality experience of white infants follows the same pattern as for the total infant mortality trend. For the nonwhites, the deceleration in the downward trend is even more marked. In the period 1933-49, the nonwhite infant mortality rate decreased 4.6 percent per annum. Between 1950 and 1956, the rate of decline slowed down to 1.2 percent per year.

In 1957, the infant mortality rate increased as a result of the widespread outbreak of influenza. A further rise was noted in the pro-

visional data for 1958, but this change is not clearly attributable solely to the influenza epidemic, which continued into 1958. The infant mortality rate for each month of 1958 except January and November was higher than the rate for the corresponding month of 1957. Taking into consideration the provisional data for 1958 and 1959, it would appear that the national infant mortality trend has almost completely leveled off, starting in 1953.

Significant changes have taken place over the years in the distribution of live births by age of mother, birth order, birth weight, and so on. It was thought that these changes might account for the change in trend of the infant mortality rate. Because mortality among infants of higher birth order or among those born to older mothers is higher than that for lower parity-age of mother groups, it is

Figure 1. Infant mortality rates, by race, United States, 1933-57



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istic of resistance in field populations of mosquitoes. This resistance to dieldrin was somewhat unexpected since this insecticide has not been employed for mosquito control in the reservoir and its agricultural use in the general area is limited.

### Summary

Tests with field-collected adults and with larvae obtained from eggs of field-collected adults established that *Anopheles quadrimaculatus* from the Clark Hill Reservoir, located near Augusta, Ga., are highly resistant to DDT. DDT has been used routinely on certain areas of the reservoir since 1952.

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## Radiological Health Training

The Division of Radiological Health reports that presentation of short-term technical courses, part of the training program of the Robert A. Taft Sanitary Engineering Center in Cincinnati, is nearing completion of its most successful year. Over 500 professional personnel from Federal agencies, State and local health departments, colleges and universities, and industry attended the 19 sessions of 12 different courses conducted during fiscal year 1960. Added to these were 47 trainees from 11 foreign countries, plus 300 personnel of the division attending special field presentations. This represented more than double the enrollment of the previous year.

The program for fiscal year 1961 is again being expanded. This is reflected in an increase both in the number and frequency with which courses will be presented. New programs include a 1-week field presentation for scientists and engineers on "Environmental Radiation Surveillance"; a special 1-week course on "Radiological Health for Nurses,"

the first such program in this important area of public health; and a 2-week course, entitled, "Orientation in Radiological Health," specifically directed toward health educators and public information personnel.

In addition, sessions of the course on "Basic Radiological Health" are scheduled for presentation at the Southeastern Radiological Health Facility in Montgomery, Ala., and the Southwestern Radiological Health Facility in Las Vegas, Nev., recently dedicated by the Surgeon General. Sessions of the courses on "Radiological Health for X-ray Technicians" and "X-ray Protection" are scheduled for presentation at another new laboratory being developed by the Division of Radiological Health in Rockville, Md.

During the period July 1, 1960-July 1, 1961, requests for further information or reservations in these courses should be directed to the Chief, Training Program, Robert A. Taft Sanitary Engineering Center, 4676 Columbia Parkway, Cincinnati 26, Ohio.

possible for total mortality to be affected by the change in proportion of births by parity, and so on, even if the force of mortality remained unchanged. Adjustment of rates for the changing distribution of live births by birth order and age of mother indicates that these factors do not account for the change in the infant mortality trend. Neither does the changing number of annual births explain this phenomenon.

Although there is no evidence to suggest this possibility, infant mortality rates could be affected by changes in registration practices. For example, it is known that deaths of some babies dying soon after birth are registered as fetal deaths rather than as infant deaths. In a significant number of cases, the total infant mortality rate and, more particularly, the neonatal mortality rate could be affected by this practice. However, there is no indication from the examination of the perinatal (fetal deaths 20 weeks and over and neonatal deaths) mortality rates that such an artifact is involved. All in all, there is little to suggest that the recent change in the infant mortality trend is not real.

In seeking an explanation for the change in the trend of infant mortality, other data were examined. Figure 2 shows the neonatal (under 1 month of age) and the postneonatal (1 to 11 months of age) mortality rates by race. The neonatal mortality rates for whites and nonwhites declined at about the same rate (3.0 percent per year) between 1935 and 1949. About 1950 the rate of decline of neonatal mortality for nonwhite infants leveled off to about 0.4 percent per year. For white infants, the rate of decline after 1950 dropped to 1.7 percent. The same kind of break in trend also occurs in the postneonatal rates, but at an earlier period. For nonwhites, the annual rate of decline prior to 1946 was about 5 percent. Since 1946, the rate of decrease dropped to 1.5 percent per year. For the white infants in the postneonatal period, the rate of decline was 5.2 percent before 1946 as compared with 4.6 percent after 1945. These rates of change were computed by the method of least squares.

A significant feature of the postneonatal mortality trends is the sharp drop in the rates

between 1945 and 1946. Data by cause of death indicate a substantial decrease in the death rates for influenza and pneumonia and for diarrhea and enteritis in 1946, with the consequent change in level of mortality from these causes after 1946. The decline in mortality from influenza and pneumonia and diarrhea and enteritis in 1946 accounted for about 58 percent of the drop in the total postneonatal mortality rate. Smaller but significant decreases in death rates were recorded for congenital malformations, congenital debility, whooping cough, and dysentery.

### Age Subdivisions

Because both neonatal and postneonatal mortality have leveled off, it seemed worthwhile examining the data in greater detail to see if the change is concentrated in any particular age group in infancy. A change in trend (fig. 3) is apparent for each age group except 1 to 6 days. Most of the infants that die in the first week of life are born and die in hospitals. The effect of nursery care should be most evident in this age group. While the mortality trend for infants in the first day of life has flattened out, the rate of decline for infants 1 to 6 days old appears to be unchanged throughout the whole period 1933-57, except for a slight break in 1944 and 1945.

For infants 1 to 4 weeks old, the rate of decrease in mortality rates was fairly steep between 1933 and 1955. It is not possible to tell whether or not there has been a change in trend for this group, but the rates for 1956 and 1957 are successively higher than the rate for 1955. For babies 1 month and 2 months of age, the trends appear to have definitely leveled off. For the older infants, 3 to 11 months old, the rate of decline has slowed down since 1946.

### Urban-Rural Trends

Examination of infant mortality trends by population-size groups indicates that the trends for cities of every size are affected, but not to the same extent. Although figure 4 presents data only for the dichotomy urban and rural, the trends for each city-size group show that they have flattened out for residents of cities over 25,000 population. The trends for urban places under 25,000 show very much the con-

Figure 2. Neonatal and postneonatal mortality rates, by race, United States, 1933-57

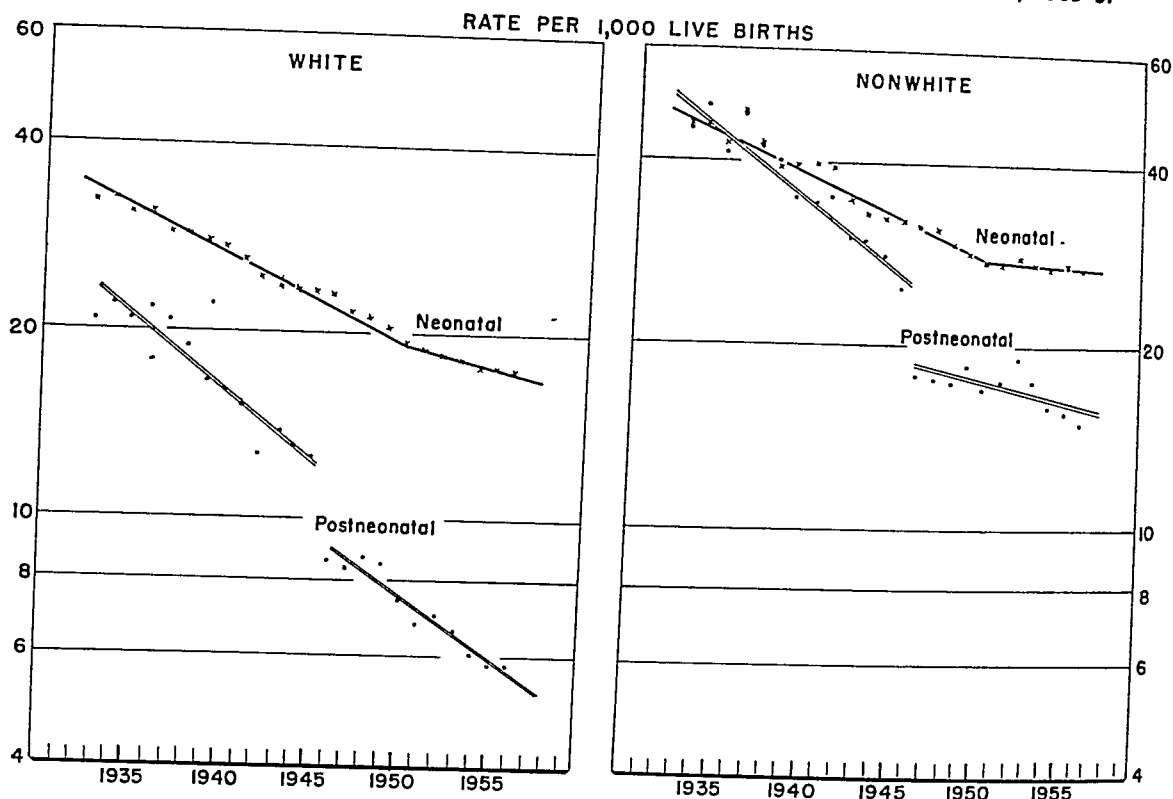


Figure 3. Infant mortality trend, by age, United States, 1933-57

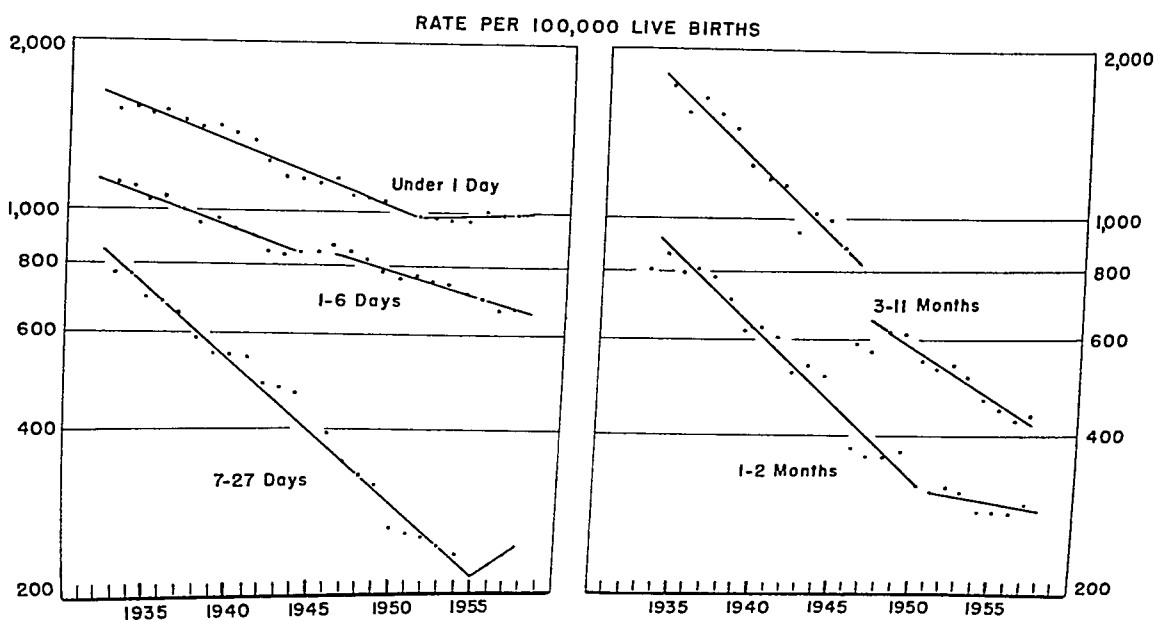
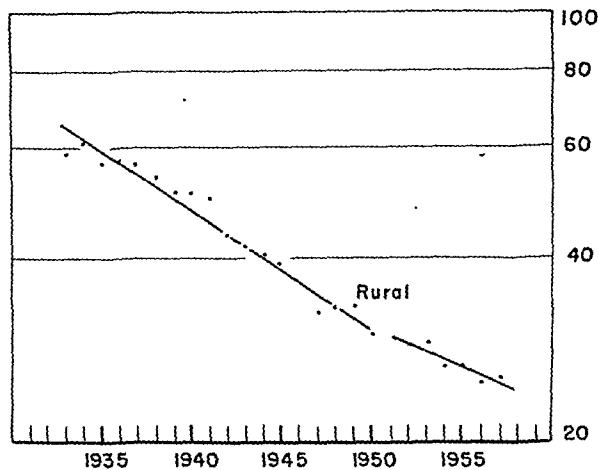
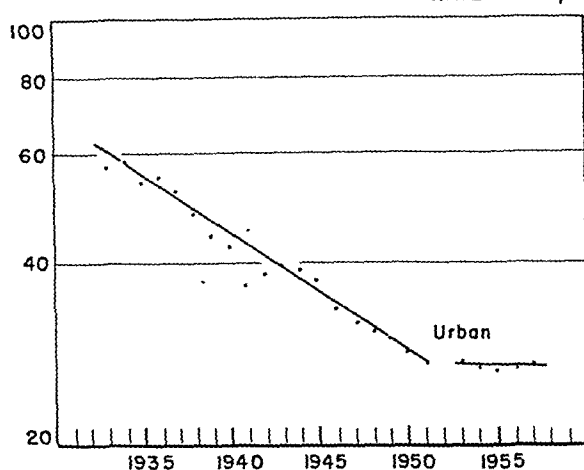


Figure 4. Infant mortality trends for urban and rural residents, United States, 1933-57

RATE PER 1,000 LIVE BIRTHS



figuration seen for the rural trend in figure 4. The rates of decline are not as great as those for the larger cities, but the trends have slowed down in an unmistakable manner.

#### State Trends by Race

Infant mortality rates for individual States were plotted and trend lines were fitted by eye. The annual rate of change or the slope of the trend line is therefore an approximation. For States with a relatively small proportion of nonwhites in the population, data for total infants only were examined. The results are shown under data for white infants in table 1, since the "total" in these cases relates primarily to the experience for white infants.

The infant mortality trends for individual States generally show the same pattern as those for the country as a whole. For the majority

of the States, there has been a marked slowing up of the rate of decline in the past 7 to 10 years. A typical trend is depicted by the data for Vermont (fig. 5).

There are several other patterns involving some 17 States and the District of Columbia. In one of these, there is an apparent reversal in trend, and the rates are now rising. The infant mortality trend for nonwhites in Maryland in figure 5 typifies this pattern. Table 2 lists the States in which the mortality trend for nonwhite infants is rising.

In another small group of States there has been a significant acceleration in the rate of decline in the infant mortality rate (see data for New Mexico, fig. 5). These areas are shown in table 3.

Another pattern involves some 10 States in which there has been no apparent change in

Table 2. States with rising mortality trend for nonwhite infants

State	Approximate point of change	Annual rate of change in percent	
		Prior to point of change	After point of change
Arkansas.....	1947	-3	+3
District of Columbia.....	1948	-6	+4
Illinois.....	1950	-4	+2
Maryland.....	1950	-6	+2
Mississippi.....	1941	-3	+1

Table 3. States with accelerated rate of decline in infant mortality rate

Area	Race	Approximate point of change	Annual rate of change (percent)	
			Prior to change	After change
New Mexico.....	White.....	1947	-4	-7
Do.....	Nonwhite.....	1950	-5	-9
Do.....	Do.....	1944	-1	-3
Do.....	Do.....	1947	-2	-5



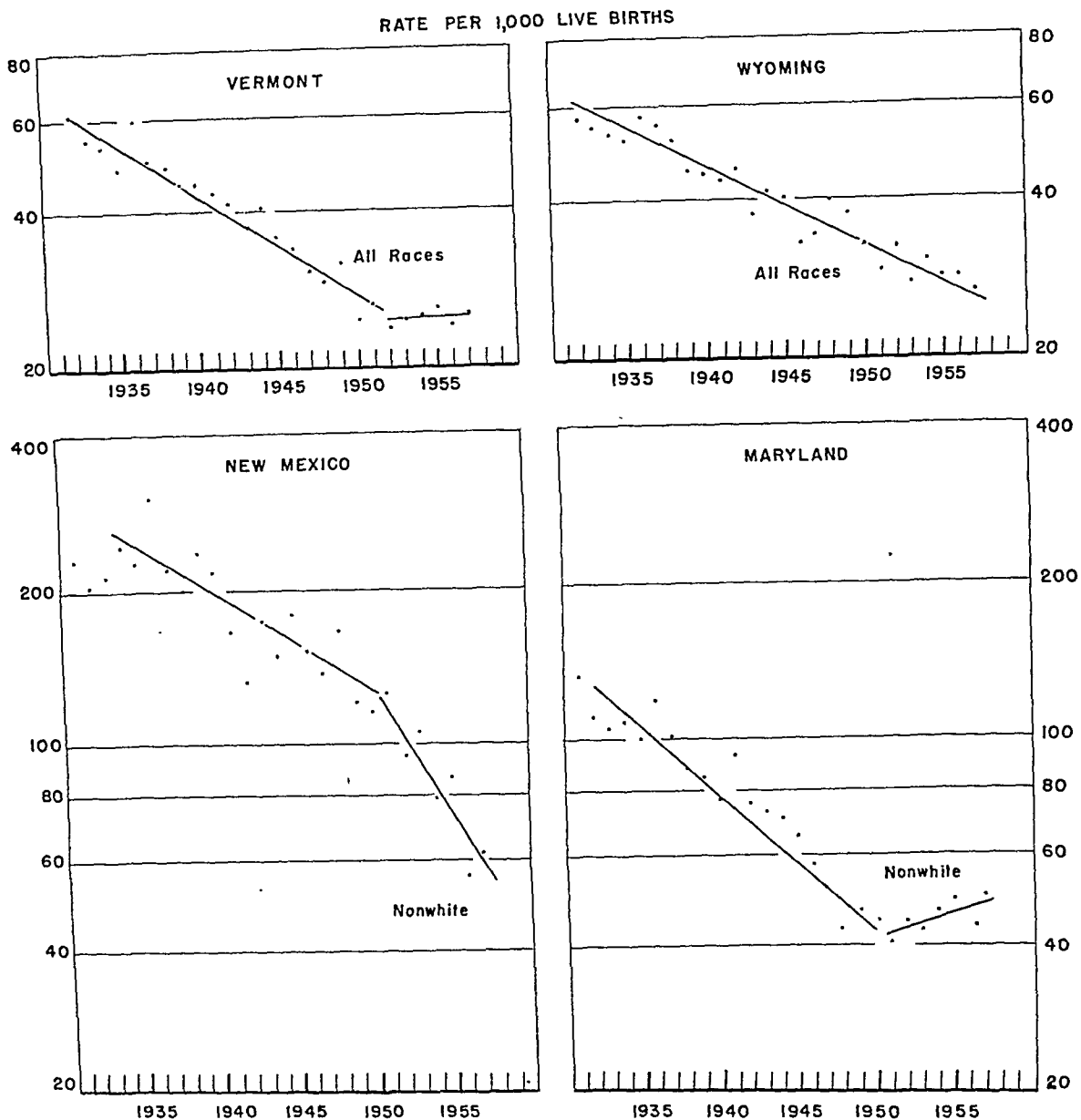
Table 1. Annual percent change in infant mortality rates by race and point of change in trend: each State, 1933-56

Area	White			Nonwhite		
	I	II	Inflection point	I	II	Inflection point
New England						
Maine.....	-3	-3	1947			
New Hampshire.....	-4	0	1953			
Vermont.....	-4	0	1953			
Massachusetts.....	-4	0	1951	-4	-4	
Rhode Island.....	-4	0	1950			
Connecticut.....	-5	0	1951	-6	+1	1947
Middle Atlantic						
New York.....	-4	0	1951	-5	0	1949
New Jersey.....	-4	0	1950	-4	0	1950
Pennsylvania.....	-4	-1	1951	-4	-1	1950
East North Central						
Ohio.....	-4	-2	1950	-5	0	1949
Indiana.....	-4	-2	1950	-3	-3	
Illinois.....	-4	-1	1950	-4	+2	1950
Michigan.....	-4	-1	1950	-4	0	1950
Wisconsin.....	-4	-2	1951			
West North Central						
Minnesota.....	-4	0	1952			
Iowa.....	-4	-2	1950			
Missouri.....	-5	-2	1949	-5	-2	1949
North Dakota.....	-4	0	1950			
South Dakota.....	-4	0	1949			
Nebraska.....	-3	0	1952			
Kansas.....	-4	-1	1950	-5	-4	1950
South Atlantic						
Delaware.....	-5	-5	1952	-4	-1	1946
Maryland.....	-6	0	1950	-6	+2	1950
District of Columbia.....	-4	0	1948	-6	+4	1948
Virginia.....	-5	-3	1950	-5	-2	1948
West Virginia.....	-2	-5	1947	-5	-2	1947
North Carolina.....	-6	-2	1951	-5	0	1947
South Carolina.....	-4	-3	1947	-7	-1	1948
Georgia.....	-5	-3	1947	-5	0	1947
Florida.....	-3	-1	1948	-3	+1	1947
East South Central						
Kentucky.....	-4	-4	(1)	-4	-2	1947
Tennessee.....	-4	-4	(1)	-5	-1	1949
Alabama.....	-4	-4	(1)	-5	-1	1947
Mississippi.....	-1	-3	1941	-3	+1	1947
West South Central						
Arkansas.....	-7	-2	1947	-3	+3	1945
Louisiana.....	-5	-1	1950	-1	-2	1946
Oklahoma.....	-4	-3	1945	-5	-2	1945
Texas.....	-5	-5	(1)	-4	0	1953
Mountain						
Montana.....	-4	-1	1951			
Idaho.....	-4	-4	(1)			
Wyoming.....	-3	-3	(1)			
Colorado.....	-5	-2	1950			
New Mexico.....	-4	-7	1947	-5	-9	1950
Arizona.....	-6	-6	(1)	-6	-6	
Utah.....	-5	-1	1950			
Nevada.....	-3	-3	(1)			
Pacific						
Washington.....	-2	-2	1947	-1	-3	1944
Oregon.....	-3	0	1950			
California.....	-4	-1	1950	-5	0	1951

1 No inflection point.

NOTE: "I" refers to trend for period before point of inflection; "II" to trend after change in trend.

**Figure 5. Infant mortality trends for selected States, 1933-57**



#### Point of Change in Trends

Of the States experiencing a change in mortality trends, the point at which the change in trend occurred is concentrated around 1950 for the neonatal rates (21 States), whereas the modal group for the postneonatal rates (10 States) is 5 years earlier, 1945. The following shows the distribution of the inflection points for the States where the rate of decline showed a marked deceleration or an increase:

Inflection point	Number of States	
	Neonatal	Post-neonatal
1954-52	7	2
1951-49	21	11
1948-46	3	11
1945-43	2	10
Total	33	34

Although the neonatal mortality trend apparently started to change in a few States about the same time as the postneonatal mortality rates, most of the changes took place

the rate of decline of the infant mortality trend (see trend for Wyoming, fig. 5). With the exception of Maine, the general trend has been continuously downward in these areas. In Maine, the infant mortality rate took a relatively large drop about 1947 and then continued to decrease at about the same rate as before. The population groups for which no change in the trend could be observed are as follows:

State	Population group
Maine.....	Total
Massachusetts.....	Nonwhite
Kentucky.....	White
Tennessee.....	White
Alabama.....	White
Texas.....	White
Idaho.....	Total
Wyoming.....	Total
Arizona.....	White
Arizona.....	Nonwhite
Nevada.....	Total

With the exception of Massachusetts and Arizona, the above groups generally involve white infants. Most of these States are in the South or in the Mountain division and they represent about one-third of the States in their respective geographic divisions.

### Point of Change by Race

Estimates of the point of inflection indicate that the changes in trend did not occur at the same time in all States. For the States which experienced a slowing down of the rate of change or an actual increase in mortality, the point of change came between 1945 and 1953. For the nonwhites, the modal year was 1947, whereas for the whites the mode came several years later in 1950.

The following table shows the points of inflection in the infant mortality rates by States for those racial groups for which there has been a deceleration in the rate of decline, or a reversal in trend.

Point of inflection	White	Nonwhite
1953.....	2	1
1952.....	3	0
1951.....	7	1
1950.....	16	6
1949.....	2	4
1948.....	2	3
1947.....	4	8
1946.....	1	2
1945.....	0	2

The point of inflection in the trend line is significant since it indicates the time when some element was introduced or when the cumulative effects of some factor or factors started to produce a change in the infant mortality trend. For more precise estimates of the inflection point, it will be necessary to fit a mathematical curve to the mortality rates.

For a number of States, there appear to be two inflection points. This occurs where there has been a rapid drop in mortality rates over a period of 2 or 3 years before the resumption of a second trend. In 10 States, the infant mortality rates for whites show an abrupt discontinuity in the trend. In nine States, the rates for nonwhites showed a similar break in trend. In only four States, Delaware, Florida, Mississippi, and Washington, did the trends for both whites and nonwhites have two points of inflection.

### State Trends by Age

Data by age more clearly delineate the medical problems involved in the death of infants than do those by race (table 4). The District of Columbia is the only area where there has been a reversal in trend for both the neonatal and postneonatal mortality rates. A similar reversal may also be observed in the postneonatal trend for Connecticut. The rates for infants in the postneonatal period in the District of Columbia and Connecticut appear to be increasing about 3 percent a year after decreasing about 8 percent or more up to 1949 or so.

In only two States, West Virginia and New Mexico, has the neonatal mortality been declining faster in the postwar than in the prewar period. On the other hand, there are 13 States where the rate of decline has not changed, and the rates have been decreasing uniformly over the whole period. These States are: Maine, Indiana, Iowa, Missouri, Delaware, Tennessee, Mississippi, Oklahoma, Texas, Idaho, Wyoming, Arizona, and Nevada.

For infants in the postneonatal period the rates are decreasing faster than before in seven States, namely, Maine, West Virginia, Kentucky, Tennessee, Texas, Colorado, and New Mexico. In three States, Wyoming, Arizona, and Nevada, the postneonatal mortality rate has continued to decline without interruption.

in 1950. On the other hand, the postneonatal mortality trends started to change earlier in a relatively large group of States in 1945 and in each succeeding period through 1951. Whatever factors were operating to change the trend of mortality of infants in the postneonatal period had their effects earlier and involved an increasing number of States in the years between 1945 and 1951. For the neonatal group, the trends were affected in two-thirds of the States in the period 1949 to 1951.

### Trend by Cause of Death

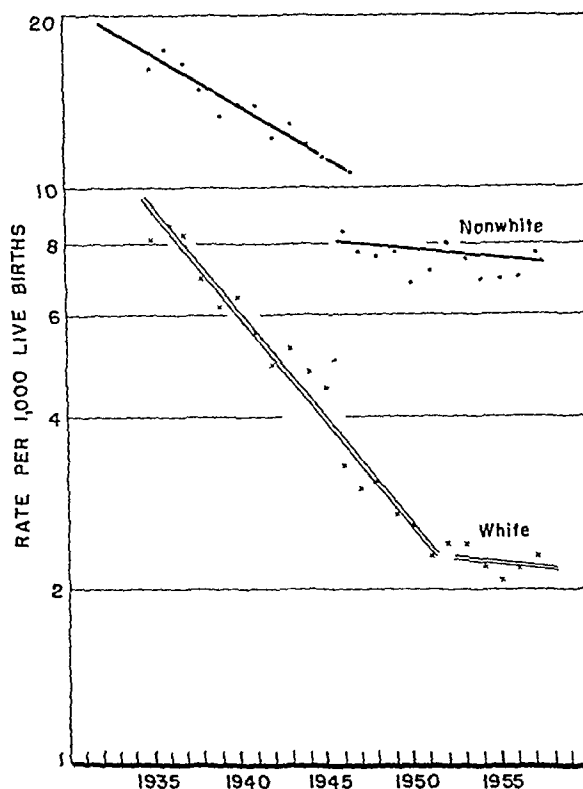
The usefulness of available information on causes of death among infants is somewhat limited on a time-trend basis because data by detailed age subdivisions have been tabulated only for a list of 45 selected causes. Another problem is that of comparability of data over a long time period. The major changes in the section on "Diseases of Early Infancy" in the Sixth Revision of the International Classification of Diseases and Causes of Death limit the interpretation of data for a number of conditions.

Despite these limitations, certain findings appear pertinent. One significant feature is the remarkable drop between 1945 and 1946 in the infectious and parasitic disease mortality rate, including influenza and pneumonia and diarrhea and enteritis. In one year, the infant mortality rate for these diseases dropped about 30 percent. By and large, there has been a general and fairly rapid decline in mortality rates for infectious diseases such as tuberculosis, syphilis, whooping cough, and dysentery. The death rates for these diseases are now practically at the vanishing point.

Mortality from diarrhea and enteritis, which is still a relatively frequent cause of death among infants in the postneonatal period, but not in the neonatal ages, shows a different pattern of trends. For the postneonatal white infants, there is a continuous declining trend. For nonwhites in the same age group, there does not appear to be any tendency for a continuation of the downward trend after the large decrease in 1946.

The rate of decline of the mortality trend for influenza and pneumonia has changed signifi-

Figure 6. Infant mortality rates for influenza and pneumonia, by race, United States, 1939-57



cantly (fig. 6). For both white and nonwhite infants in the first month of life, there was a marked flattening out of the trend for influenza and pneumonia starting about 1950. For nonwhite neonates, the influenza and pneumonia mortality rates subsequent to 1950 are at a higher level than they have been during the preceding 5-year period. Among infants in the postneonatal period, the influenza and pneumonia trend for nonwhites leveled off shortly after the precipitous drop in 1946. The trend for whites continued to decline until it leveled off starting about 1951.

A most dramatic reversal of trend may be seen in the death rates for respiratory diseases other than influenza and pneumonia (fig. 7). For infants in the neonatal period, the infant mortality rates for this group of respiratory diseases declined until about 1950 and then rose rapidly. The neonatal rate for whites showed a tenfold increase in about 8 years. The rate for nonwhites did not increase as rapidly as the rate for whites but the curve

Table 4. Annual percent change in neonatal and postneonatal mortality rates and point of change in trend: each State, 1933-56

Area	Neonatal			Postneonatal		
	I	II	Inflection point	I	II	Inflection point
New England						
Maine.....	-4	-4	1948	-3	-6	1946
New Hampshire.....	-4	0	1949	-7	0	1947
Vermont.....	-4	0	1950	-7	+1	1950
Massachusetts.....	-3	0	1952	-9	0	1950
Rhode Island.....	-4	-1	1950	-10	0	1948
Connecticut.....	-4	0	1950	-9	+3	1949
Middle Atlantic						
New York.....	-3	0	1952	-8	-2	1950
New Jersey.....	-3	-1	1954	-8	0	1951
Pennsylvania.....	-3	-1	1953	-8	-3	1952
East North Central						
Ohio.....	-3	-1	1950	-6	-4	1946
Indiana.....	-3	-3	-----	-5	-5	1946
Illinois.....	-3	-1	1950	-7	0	1951
Michigan.....	-3	0	1951	-6	-4	1946
Wisconsin.....	-3	-2	1950	-7	-2	1949
West North Central						
Minnesota.....	-3	0	1953	-6	0	1951
Iowa.....	-3	-3	-----	-8	-3	1949
Missouri.....	-3	-3	-----	-6	-4	1945
North Dakota.....	-4	0	1951	-9	-6	1946
South Dakota.....	-4	-1	1947	-7	0	1951
Nebraska.....	-3	0	1952	-7	0	1950
Kansas.....	-3	-2	1950	-9	-2	1950
South Atlantic						
Delaware.....	-2	-2	1945	-7	-3	1945
Maryland.....	-4	-1	1951	-11	-2	1949
District of Columbia.....	-2	+2	1947	-8	+3	1949
Virginia.....	-4	-2	1950	-6	-5	1946
West Virginia.....	-3	-4	1946	-4	-8	1946
North Carolina.....	-4	-1	1950	-5	-1	1945
South Carolina.....	-4	-3	1949	-6	-1	1945
Georgia.....	-5	-1	1950	-6	-1	1945
Florida.....	-3	-2	1948	-5	0	1945
East South Central						
Kentucky.....	-3	-1	1949	-5	-7	1949
Tennessee.....	-3	-3	-----	-5	-6	1946
Alabama.....	-1	-2	1941	-5	-2	1945
Mississippi.....	0	-1	1944	-7	0	1945
West South Central						
Arkansas.....	-1	-1	1941	-10	-4	1948
Louisiana.....	-3	+1	1952	-8	-4	1945
Oklahoma.....	-3	-3	-----	-6	-4	1945
Texas.....	-3	-3	-----	-6	-8	1949
Mountain						
Montana.....	-3	-2	1949	-10	-2	1947
Idaho.....	-3	-3	-----	-7	0	1953
Wyoming.....	-2	-2	-----	-6	-6	-----
Colorado.....	-3	-1	1950	-5	-6	1945
New Mexico.....	-3	-5	1947	-5	-10	1947
Arizona.....	-4	-4	-----	-9	-9	-----
Utah.....	-4	-1	1949	-8	-4	1948
Nevada.....	-2	-2	-----	-6	-6	-----
Pacific						
Washington.....	-3	-2	1947	-5	-1	1947
Oregon.....	-3	-1	1950	-7	-1	1948
California.....	-3	0	1950	-8	-1	1950

NOTE: "I" refers to trend for period before point of inflection; "II" to trend after change in trend.

in 1950. On the other hand, the postneonatal mortality trends started to change earlier in a relatively large group of States in 1945 and in each succeeding period through 1951. Whatever factors were operating to change the trend of mortality of infants in the postneonatal period had their effects earlier and involved an increasing number of States in the years between 1945 and 1951. For the neonatal group, the trends were affected in two-thirds of the States in the period 1949 to 1951.

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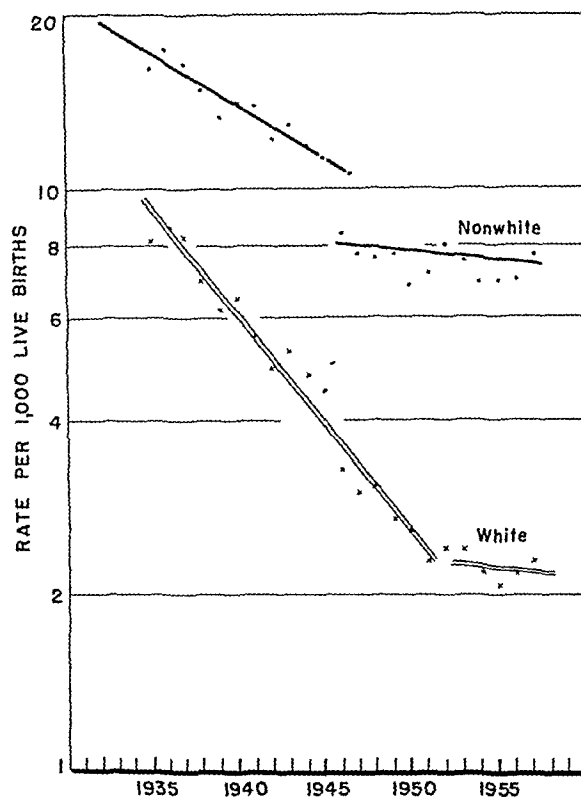
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Despite these limitations, certain findings appear pertinent. One significant feature is the remarkable drop between 1945 and 1946 in the infectious and parasitic disease mortality rate, including influenza and pneumonia and diarrhea and enteritis. In one year, the infant mortality rate for these diseases dropped about 30 percent. By and large, there has been a general and fairly rapid decline in mortality rates for infectious diseases such as tuberculosis, syphilis, whooping cough, and dysentery. The death rates for these diseases are now practically at the vanishing point.

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cantly (fig. 6). For both white and nonwhite infants in the first month of life, there was a marked flattening out of the trend for influenza and pneumonia starting about 1950. For nonwhite neonates, the influenza and pneumonia mortality rates subsequent to 1950 are at a higher level than they have been during the preceding 5-year period. Among infants in the postneonatal period, the influenza and pneumonia trend for nonwhites leveled off shortly after the precipitous drop in 1946. The trend for whites continued to decline until it leveled off starting about 1951.

A most dramatic reversal of trend may be seen in the death rates for respiratory diseases other than influenza and pneumonia (fig. 7). For infants in the neonatal period, the infant mortality rates for this group of respiratory diseases declined until about 1950 and then rose rapidly. The neonatal rate for whites showed a tenfold increase in about 8 years. The rate for nonwhites did not increase as rapidly as the rate for whites but the curve

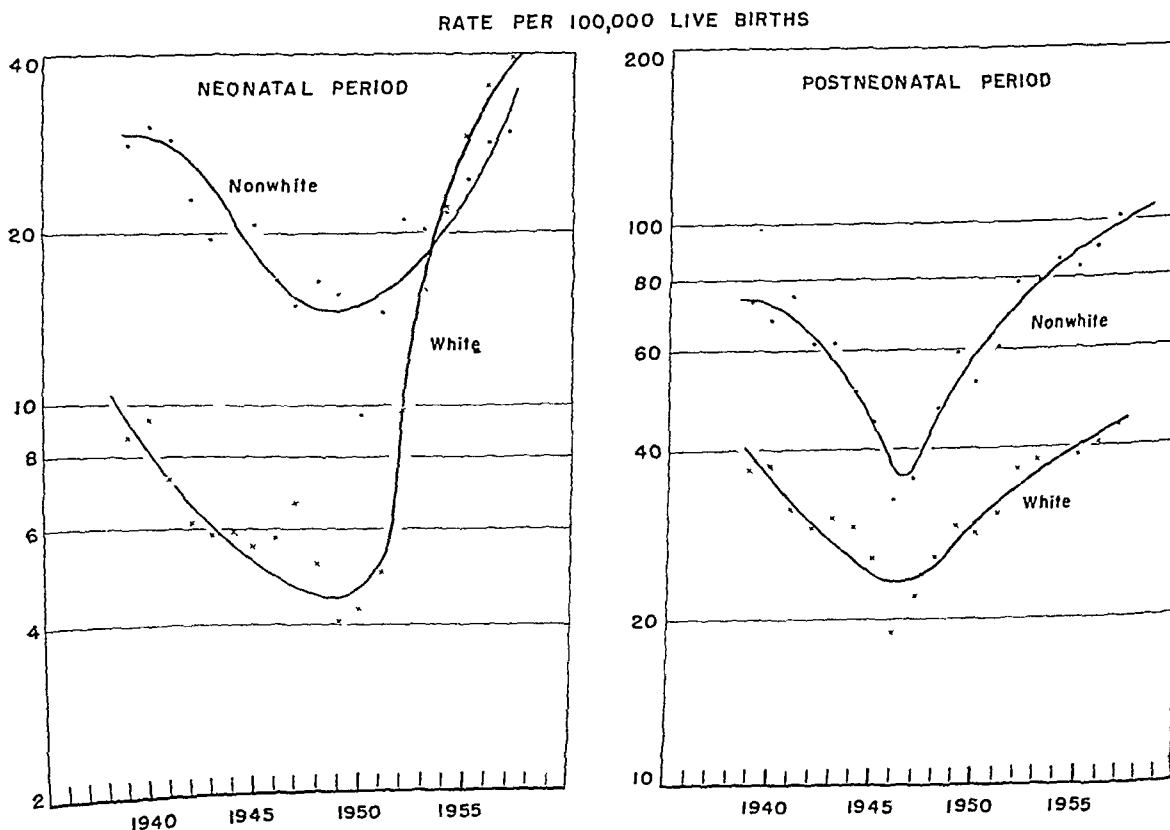
is definitely U-shaped. The same kind of reversal in trend may be seen in the postneonatal mortality rates for this group of respiratory diseases as in the neonatal rates. The rise in the trend of the postneonatal rates started around 1947, whereas that for the neonatal rates started about 1950.

The main components of the group of respiratory diseases other than pneumonia and influenza, for which mortality rates are undergoing an apparent reversal in trend, appear to be hyaline membrane disease for the neonates, and fibrosis of lung and chronic or unspecified interstitial pneumonia for infants in the postneonatal ages. Hyaline membrane disease not otherwise specified is classified under the category "Other diseases of lung and pleura" (International List No. 527.2). Most of the 1,596 deaths classified to "Other diseases of lung and pleura" in 1957 are probably those reported as hyaline membrane

disease. This disease is being reported with increasing frequency. Prior to the recognition of the condition, it was probably reported as immaturity, unqualified, or asphyxia.

Although deaths attributed to hyaline membrane disease probably represent most of the neonatal deaths from respiratory diseases other than pneumonia and influenza, the category "Other chronic interstitial pneumonia" accounts for only a relatively small proportion of postneonatal respiratory disease mortality. In 1957, 709 deaths among infants over 1 month old were assigned to "Other chronic interstitial pneumonia," out of a total of 2,221 deaths for this age group classified as diseases of the respiratory system other than influenza and pneumonia. In some 1,253 postneonatal deaths from this group of respiratory diseases, the precise nature of the diseases involved cannot be identified without further tabulation. Of the possible causes, bronchiectasis may be the

**Figure 7. Infant mortality rates for certain respiratory diseases other than influenza and pneumonia, by race, United States, 1939-57**



condition which accounts for a large part of the deaths from diseases of the respiratory system other than pneumonia and influenza in the postneonatal period.

The infant mortality rate for congenital malformations is declining for white infants, while for nonwhite infants it is increasing (fig. 8). In both cases, the rate of change in the trend is relatively small.

For the group of diseases classified as diseases of early infancy but excluding pneumonia and diarrhea of the newborn, there has been a relatively steady decline in mortality trend (fig. 8). The rate of decrease is greater for white infants than for nonwhites. However, there is no break in these trends which serves to explain the change in the overall infant mortality trends.

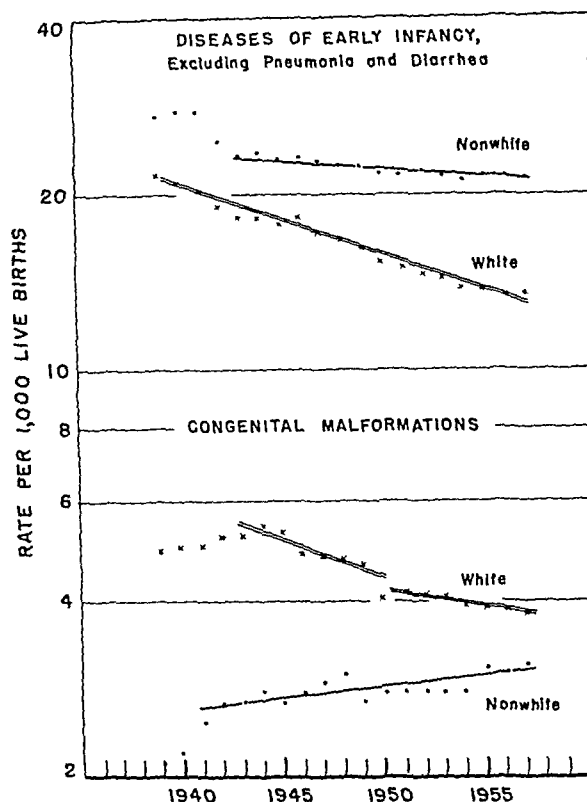
The ill-defined and unknown causes of death among infants represent a relatively large frequency. However, the mortality trend for causes of death so attributed has been declining fairly regularly for all except the postneonatal rates for nonwhite infants. The rate for this group has leveled off somewhat since 1947.

Accidents constitute a relatively frequent cause of death among infants. However, there is nothing unusual in the trend of mortality from violence which can account for the changes in the overall trend. On the other hand, the trend for the residual group, "All other causes," levels out after a period of decline. It was not possible from the data at hand to examine separately the diseases and conditions involved in this residual group.

In summary, it seems clear that influenza and pneumonia are primarily responsible for the change in the infant mortality trend. Although the infant mortality rate for diseases of the respiratory system other than influenza and pneumonia is now less than one-third of the rate for influenza and pneumonia, it is increasing rapidly. Unless it is checked, it will, before too long, exceed the mortality from influenza and pneumonia among infants.

The impact of any change in trend of mortality from any disease on the total mortality trend depends on the relative frequency of the disease. As may be seen in table 5, approximately three-fourths of all neonatal deaths are attributable to the diseases of early

Figure 8. Infant mortality rates, by race, United States, 1939-57



infancy, which are comprised principally of birth injuries, postnatal asphyxia, and prematurity. Next in the order of frequency are the congenital malformations. The infectious diseases rank third, but their relative frequency amounts to only about 9 percent of all deaths in the neonatal period. The pneumonias and other infections of the newborn and hyaline membrane disease are the most significant problems that can be categorized under the infectious diseases. In this connection, there is the problem of classifying hyaline membrane disease because deaths involving this disease may be attributed to atelectasis, pneumonia of newborn, or other diseases of lung and pleura, depending upon the physician's statement of causes of death.

For infants in the postneonatal period, deaths from the infectious diseases predominate. Influenza and pneumonia, and diarrhea and enteritis appear to be the principal problems. There also appear to be certain diseases of the respiratory system, possibly bronchioc-



is definitely U-shaped. The same kind of reversal in trend may be seen in the postneonatal mortality rates for this group of respiratory diseases as in the neonatal rates. The rise in the trend of the postneonatal rates started around 1947, whereas that for the neonatal rates started about 1950.

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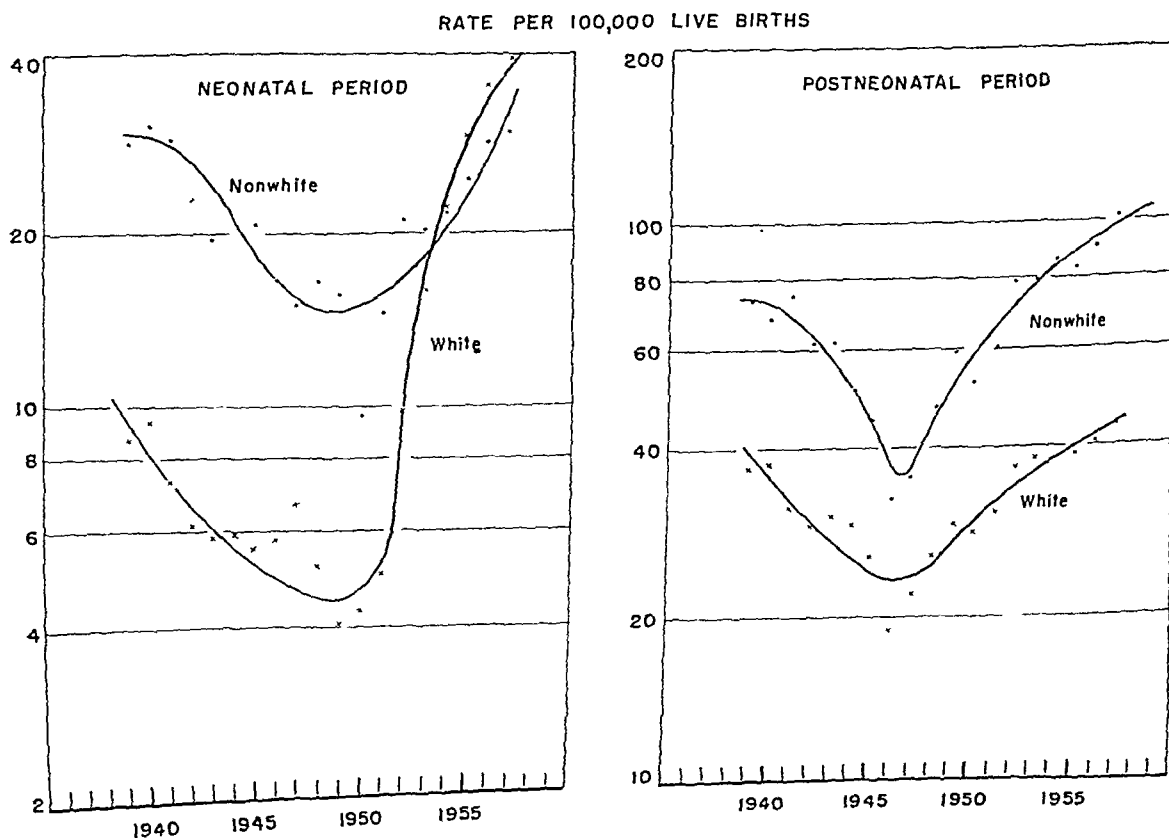
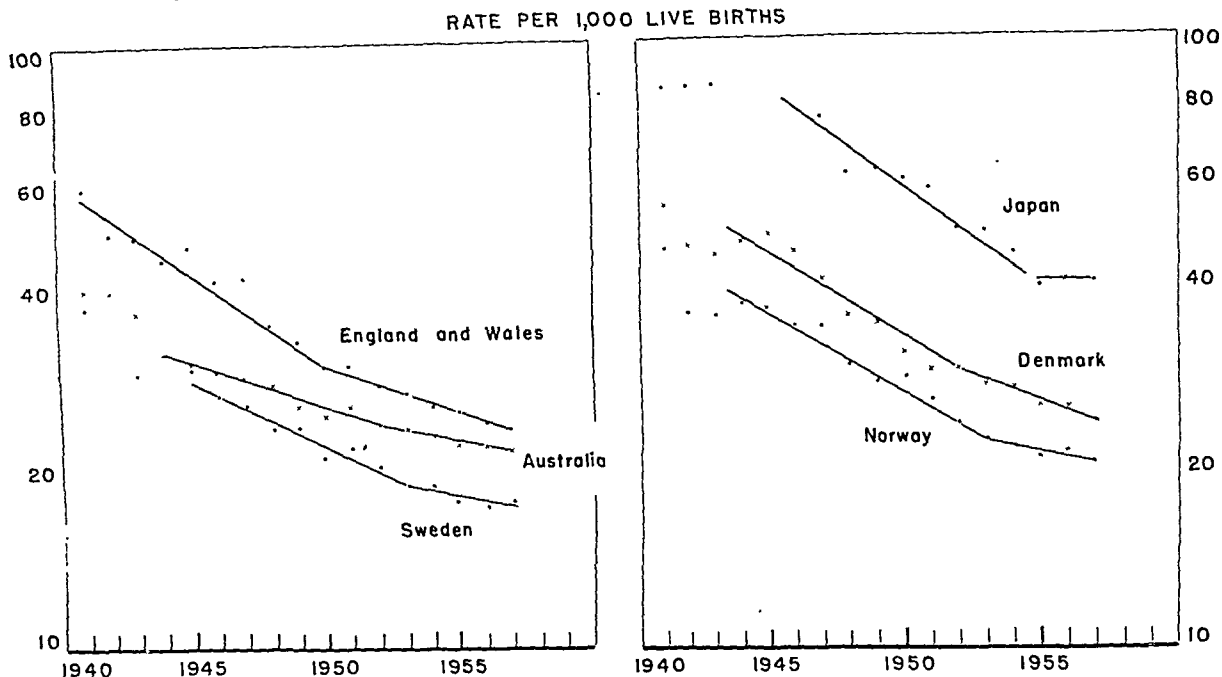


Figure 9. Infant mortality rates for certain countries of low mortality, 1941-57



However, the postneonatal mortality trend has also been influenced. The infant mortality trends for urban places of 25,000 or more have almost completely flattened out. For smaller cities and rural areas, the rates are still declining, but the rates of decrease have slowed down markedly.

The change in mortality trend has not been limited to any particular section of the country, although the continuing downward trend for many Mountain States has been remarkably unaffected. In a few States, there has been an acceleration in the decline. The degree of leveling off of the trend is not uniform in various parts of the country. In a few areas, the trend of infant mortality appears to be rising.

The problem of the development of drug-resistant strains of organisms has been mentioned frequently. If this were the total explanation for the change in trend of infant mortality, the resistant organisms must have become a problem for the nonwhites almost immediately after the introduction of penicillin whereas, for the white infants, it took several years before the effects became evident. Unfortunately, there is relatively little statistical information on this subject for the country

as a whole. Dauer (1) has reported a steady and rapid increase in deaths from staphylococcal septicemia and pyemia in the total population since 1949, as well as in the deaths from sepsis of the newborn. However, the total number of deaths attributable to such infections is still relatively small. Unless these deaths are indicative of the much greater problem of staphylococcal infections, they do not serve to explain the change in the infant mortality trend.

The change in infant mortality trend appears to be due to the combination of two factors, the change in the rate of decline of mortality from influenza and pneumonia and the slow-changing character of the trend for the perinatal causes of mortality; that is, congenital malformations and certain diseases of early infancy. This may be depicted schematically (fig. 10).

For purposes of simplification, it may be assumed that mortality among infants is due to two major factors, infectious diseases and perinatal causes. Furthermore, it may be assumed that there is no change in the trend for the perinatal causes. Suppose that, at point A, bactericidal agents such as the sulfa drugs were introduced for therapeutic purposes. If

tasis and pulmonary congestion and hypostasis which seem worth while looking into. The diseases of early infancy are no longer of importance in the postneonatal ages, but congenital malformations become relatively of greater significance. Also, deaths from accidents begin to assume greater importance to infants in this age group.

### Experience in Other Countries

Data for a number of countries of low infant mortality were examined. These were Norway, Sweden, Denmark, the Netherlands (not shown in chart), England and Wales, New Zealand, and Australia. The infant mortality trends for all of these countries, except New Zealand (not shown in chart), show the same kind of configuration as that observed for the United States (fig. 9). The infant mortality rates for New Zealand have been rather erratic, but the leveling-off effect is there from 1954. In the other countries, the turning point in the trend appears to be between 1949 and 1954.

The trend for Japan, a country with a relatively high infant mortality, suggests that the magnitude of mortality is not a factor in deter-

mining whether or not a leveling-off effect occurs. The infant mortality rates for the various States in the United States also demonstrate this point.

### Discussion

The situation with respect to infant mortality trends may be summarized as follows: For years, the infant mortality rates in the United States declined rapidly, principally because of the reduction in mortality from the infectious diseases. Between 1945 and 1946, there was an unusually sharp break in the death rate for the infectious diseases coincident with the availability of penicillin for civilian use. Also a possible factor was the availability of DDT, which had its impact on mortality from the diarrheal diseases. This was followed by a basic change in the overall infant mortality trend. The trends for both whites and nonwhites, and more particularly the latter, have been affected. The sharp leveling off of the trend for nonwhite infants started about 1946; that for white infants, about 1950. The neonatal mortality trend has changed to a greater extent than that for the postneonatal rates.

**Table 5. Number of deaths among infants, by cause, age, and race: United States, 1957**

Cause of death	Total		White		Nonwhite	
	Neonatal	Post-neonatal	Neonatal	Post-neonatal	Neonatal	Post-neonatal
All causes.....	81, 088	31, 006	63, 491	20, 921	17, 597	10, 085
Infectious diseases.....	7, 043	16, 220	4, 940	10, 119	2, 103	6, 101
Influenza and pneumonia <sup>1</sup> .....	3, 792	9, 534	2, 510	5, 930	1, 282	3, 604
Other diseases of respiratory system <sup>2</sup> .....	1, 624	2, 221	1, 437	1, 578	187	643
Other chronic interstitial pneumonia.....	17	709	16	512	1	197
Other diseases of lung and pleura <sup>3</sup> .....	1, 354	242	1, 224	158	130	84
Other.....	253	1, 270	197	908	56	362
Diarrhea and enteritis <sup>4</sup> .....	524	3, 088	268	1, 650	256	1, 438
Other infections of newborn.....	838	18	559	14	279	4
Other <sup>5</sup> .....	265	1, 359	166	947	99	412
Congenital malformations.....	10, 102	5, 699	8, 971	4, 884	1, 131	815
Diseases of early infancy <sup>6</sup> .....	60, 833	1, 452	47, 000	838	13, 033	614
Accident and infanticide.....	376	3, 421	264	2, 358	112	1, 063
Ill defined and unknown.....	1, 192	1, 365	476	605	716	760
All other.....	2, 342	2, 849	1, 840	2, 117	502	732

<sup>1</sup> Includes pneumonia of newborn.

<sup>2</sup> International List categories 470-475, 500-527.

<sup>3</sup> Hyaline membrane disease probably constitutes bulk of this category.

<sup>4</sup> Includes diarrhea of newborn.

<sup>5</sup> International List categories 001-138, 765-768.

<sup>6</sup> Excludes pneumonia and diarrhea of newborn and other infections of newborn.

flat, the combined effect of these trends exerts considerable influence on the trend for all neonatal deaths. Therefore, the neonatal mortality trend has practically leveled off.

For infants in the postneonatal period, the infectious disease mortality still amounts to slightly less than half of all postneonatal deaths among white infants, and over 60 percent for nonwhites. For this group of infants, there is not the same solid floor provided by the congenital malformations and diseases of early infancy as in the case of the neonates.

Therefore, the leveling-off effect of the infectious disease trend is not reinforced as much by the relatively flat trends of mortality from congenital malformations and diseases of early infancy.

The overall infant mortality trend is affected more by the pattern of neonatal mortality trend than by postneonatal death rates. For every three postneonatal deaths, there are now eight neonatal deaths.

From the examination of these data, it would appear that no marked change downward in the infant mortality rate can be expected until the attack on influenza and pneumonia is altered. There is need for detailed epidemiological studies of the circumstances sur-

rounding infant deaths from these infectious diseases to determine the possible causes of their failure to respond to therapy as might be expected. The factors surrounding deaths presently attributed to hyaline membrane disease and other respiratory diseases appear worthwhile exploring.

No substantial progress in reducing infant mortality will be made until there is a breakthrough in dealing with congenital malformations and the diseases of early infancy, such as birth injuries, postnatal asphyxia, and premature delivery of infants. The hard core of the problem has been relatively untouched.

Although a relatively low infant mortality rate has been achieved, the number of infant deaths occurring annually in the United States is exceedingly high, due to the unprecedented number of births since World War II. The total number of infant deaths in the United States in 1958 was 113,789, the largest number ever recorded in the history of the country. The infant mortality problem of today does not appear to be one which can be viewed with complacency.

#### REFERENCE

- (1) Dauer, C. C.: Septicemia. Epidemiological notes. Pub. Health Rep. 74: 354, April 1959.

## Community Survey of Polio Vaccinated Urged

Supplies of unused polio vaccine total 26.4 million doses, although more than 90 million Americans still need to be vaccinated, according to Dr. Leroy E. Burney, Surgeon General of the Public Health Service.

For the past 4 years, he pointed out, there has been a surplus of vaccine in the spring and winter followed by a shortage in the summer when the rise of poliomyelitis cases reminds people they should get vaccinated. The problem can be solved only if the following facts are stressed:

- The vaccine is most effective if used before poliomyelitis is prevalent.
- The vaccine manufacturing process takes about 4 months; if demand for vaccine is low in the spring, supplies are likely to be low in the summer, since the spring supply may be outdated by then.
- It is the third shot, due 7 months or more

after the first two that gives the greatest protection. A fourth shot a year after the third adds even greater protection.

Most poliomyelitis epidemics start in neighborhoods with concentrations of unvaccinated people. Infants and children under 5 years of age have accounted for almost half of all paralytic cases in the past 2 years, Dr. Burney said, yet about half of the children in these age groups still lack optimum protection against the disease.

He urged leaders of local medical societies, health departments, and National Foundation chapters to carry out surveys in their communities to find the unvaccinated and persuade them to be vaccinated promptly. Surveys can be completed within a few days through use of a system developed by the Public Health Service, which will be provided to interested communities.

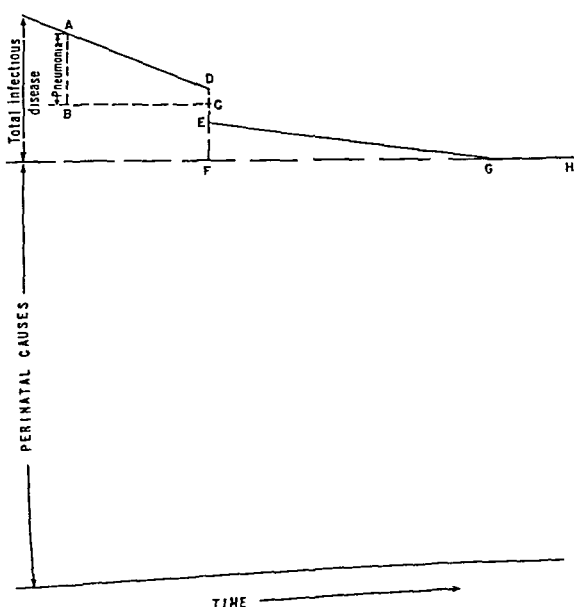
these drugs were 100 percent effective in the treatment of pneumonia, for example, and if all infants with pneumonia were treated with these drugs, the infant mortality rate would drop from A to B in 1 year. In subsequent years, the trend would continue in a straight line BC. However, the drugs do not completely prevent deaths. Furthermore, not all the infant population with pneumonia comes under drug therapy. Therefore, the actual movement of mortality would follow the curve AD. At point D, a new therapeutic agent is introduced, say, penicillin. Assume that this agent is effective in preventing mortality from pneumonia and all other infectious diseases. If the drug were 100 percent effective and all infectious diseases were treated, the mortality rate should drop from D to F and a new trend, FG, would be established. However, not all the infants contracting infectious diseases are treated nor is the antibiotic 100 percent effective. On the other hand, the sharp drop in mortality from D to E is indicative of the effectiveness of penicillin in reducing mortality. A new trend, EG, is established until infectious disease mortality reaches zero at point G. With the elimination of infectious diseases as

causes of death, the infant mortality trend follows the course of mortality from the perinatal causes, G to H, which is essentially flat.

In the recorded data for total infant mortality, the declining trend prior to 1945 may be observed. There is a drop in mortality between 1945 and 1946 followed by a continuation in the downward trend but at a smaller rate of decline. For all infants, this suggests that infectious disease mortality is approaching an asymptote. The rising trend of mortality from respiratory diseases other than influenza and pneumonia is a relatively small but contributing factor in slowing up the rate of decline in infectious disease mortality. The notion of any asymptote for infectious disease mortality as shown in the schematic diagram might be applicable here, but the evidence does not completely support this point of view. The infectious disease mortality rates for non-white infants started to level off at a much higher point than for the whites. Also, these rates declined at a much slower rate for non-whites than for whites immediately after the large decrease in 1946. For white infants, the relative reduction in infectious disease mortality rate in 1946 was much greater than for nonwhites. However, the trend for white infants continued downward without interruption until 1951 when the rates started to decline more slowly but not as slowly as those for non-white infants. The difference in pattern between the trends for whites and nonwhites suggests possible differences in the method of treatment of infectious diseases or the extent of use of available therapeutic agents or procedures. On the other hand, the consistency of the pattern of infant mortality trends internationally indicates a more basic problem which is not peculiar to the United States.

Because the proportion of infectious disease mortality to total deaths is so different in the neonatal as compared with the postneonatal period, the pattern of trends is different. For infants in the neonatal period, deaths from infectious diseases constitute less than 10 percent of mortality from all causes in this group, and most of the deaths (74 percent) are due to the diseases of early infancy. Because the mortality trends of diseases of early infancy and congenital malformations are relatively

**Figure 10. Schematic diagram of course of infant mortality, assuming certain changes in mortality from infectious diseases and perinatal cause mortality**



# Infant Mortality in Pennsylvania, 1954-58

JOHN H. VINYARD, Jr., M.P.H.

ONE of the most striking changes in health statistics in Pennsylvania and the United States can be seen in the infant mortality figures recorded during the last half century. An examination of these data indicates that the infant death rate in Pennsylvania has been reduced from 145.8 per 1,000 live births during the period 1906-09 to less than 25 infant deaths per 1,000 live births during the period 1954-58. A comparable reduction is observable in national statistics; 95.7 during 1915-19 to less than 27 during 1954-58.

Table 1 indicates infant death rates for Pennsylvania, 1906-58, and the expanding birth registration area of the United States, 1915-58. Sharp decreases from period to period occurred in Pennsylvania from 1906 to the late forties and early fifties, but the rate has essentially stabilized since 1953. The period of rapid decline for the United States ended in the mid-forties although the trend remained downward until 1953. The United States rate for each year since 1953 shows very little variation.

Stabilization of the infant death rate at this level is of great concern to the medical profession, since further reduction in mortality during the first year of life is possible. However, from a statistical point of view, if stabilization of the infant death rate has occurred, it is meaningful and is of interest to determine whether an annual change in the rate (either upward or downward) is statistically significant or whether the change is within the inherent variability of a stable rate. Identification of the components of the change in rate is

equally important for planning purposes, regardless of the presence or absence of statistical significance.

## White and Nonwhite Mortality

Levels of infant mortality are significantly affected by sex, race, and age at death. These differentials are apparent in table 2. Approximately 42 percent of the total infant mortality occurs within 1 day of birth, 68 percent in less than a week, and 77 percent before 4 weeks of life are completed. Male mortality is about one-third greater than female mortality for both races and at each age level, and nonwhite mortality is about twice as great as white mortality for each sex and at each age level. Even though the mortality differentials by sex and age are large, these factors do not ordinarily contribute significantly to changes in the total rate because their proportional effect on total mortality remains essentially stable.

The greatest differential in mortality is between the white and nonwhite components, and this differential can influence the total mortality rate without any change in the race-specific rates. For example, in 1957 the crude infant death rate was 24.5, the white rate was 22.3, and the nonwhite rate was 44.7; the rates being based on 254,997 live births, of which 229,793 were white and 25,204 nonwhite. Had the 1957 race-specific rates (22.3 and 44.7) remained constant and been applied to the 1958 birth cohort (white, 224,043 and nonwhite, 25,767), there would have been 4,996 white infant deaths and 1,152 nonwhite infant deaths. The total infant mortality rate would then be  $(6,148/249,810) \times 1,000$ , or a rate of 24.6 per 1,000 live births. While this is a minimal change in

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# Radiation Exposure

*These comments were offered by Secretary of Health, Education, and Welfare Arthur S. Fleming in response to questions at his news conference of February 25, 1960.*

The February 19, 1960, issue of *Science* contains a report of the Ad Hoc Committee of the National Committee on Radiation Protection and Measurements and a covering note by the chairman, Dr. Lauriston S. Taylor. The Ad Hoc Committee report contains no specific numerical recommendations on maximum permissible limits. It does, however, indicate that such limits should be based on factors above natural background radiation, rather than factors below levels at which demonstrable injury has occurred.

The covering note by Dr. Taylor states that the National Committee on Radiation Protection recommends the interim use of the levels recommended by the International Committee on Radiation Protection until the NCRP has completed its study of the recommendations of its subcommittee I. The number for strontium 90 would be 33 micromicrocuries per liter.

It should be emphasized that the so-called permissible limits are only calculated estimates. They will continue to be subject to change one way or another as more and better scientific data are developed about radioactive elements and their effect on the human body.

There has been for some time considerable discussion related to possible lowering of the recommended levels for some elements, such as strontium 90. Further consideration should continue to be given to the amount of strontium 90 which is distributed and retained in the body. A great deal more research is needed to provide data for a more accurate correlation between the amounts found in foodstuffs and their lodgment in the body.

The levels recommended by the NCRP represent thus far the most informed scientific opinion available to us. Pending recommendations to the President by the Federal Radiation Council and the President's action on these recommendations, the Department of Health, Education, and Welfare will continue, as in the past, to relate levels of strontium 90 in milk, water, and food to the values recommended by the NCRP as permissible for lifetime

exposure. This means that for the time being, the Department will use a factor of 33 micromicrocuries per liter for strontium 90 rather than the earlier factor of 80 micromicrocuries per liter.

The Department of Health, Education, and Welfare has never indicated that exposures below these benchmark levels were absolutely safe. At the same time, we have pointed out that the recommended levels relate to exposure over an entire lifetime and may be exceeded by varying amounts and for varying periods without causing appreciable harm to the individual. Measurements of radiation levels in air, water, milk, and food in various parts of the country are useful primarily as indicators of the scope and nature of health problems which may be developing for specific population groups and as guides for corrective action.

It should be noted that the highest count for radiation in the milk sampling network was 37.3 micromicrocuries per liter at St. Louis in April 1959. The highest annual average was 21.1 micromicrocuries per liter at St. Louis for the year ending October 1959.

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ED. NOTE: The report of the Ad Hoc Committee of the National Committee on Radiation Protection and Measurements contains these statements in the conclusions:

"The committee believes that present evidence is not sufficient to establish the dose-response curve for somatic effects at low doses. In the absence of such information, the committee has chosen to make the cautious *assumption* that there is a proportional relation between dose and effect and that the effect is independent of dose rate or dose fractionation.

"On this, or any other nonthreshold assumption, it follows that even the smallest dose is associated with some risk. Under these circumstances, the exposure of the population to any increase in radiation should not occur unless there is reason to expect some compensatory benefits."

The report proceeds then to say:

"We believe that the population permissible somatic dose from manmade radiations, excluding medical and dental sources, should not be larger than that due to natural background radiation, without a careful examination of the reasons for, and the expected benefits to society from a larger dose."

the total rate, it is a result of an increase in the proportion of nonwhite live births from 9.9 to 10.3 percent of total live births and not the result of any change in either the white or nonwhite rate.

Conversely, changes may occur in both the white and nonwhite rate with no discernible change in the total rate. The white infant death rate in 1957 was 22.3, or slightly lower than the

1956 white rate of 22.6, while the nonwhite rate in 1957 was 44.7, an increase over the 1956 rate of 42.1. A 0.3 per 1,000 decrease in the white rate counterbalanced a 2.6 per 1,000 increase in the nonwhite rate; the overall crude infant mortality rate was 24.5 for both 1956 and 1957. Because of the mortality differentials between sex, race, and age, and their individual impact on the total infant death rate, no meaningful ap-

**Table 3. Infant death rates per 1,000 live births of Pennsylvania residents by sex and race, 1954-58 and averages 1954-57 and 1954-58**

Sex and race	1954	1955	1956	1957	Average 1954-57	1958	Average 1954-58	P <sup>1</sup>
Under 1 year								
Total.....	24.9	24.6	24.5	24.5	24.6	25.5	24.8	0.01
Male.....	28.4	28.0	28.2	27.1	27.9	29.1	28.2	.02
Female.....	21.3	21.0	20.6	21.7	21.2	21.7	21.3	.28
White.....	23.1	22.7	22.6	22.3	22.7	22.8	22.7	.79
Male.....	26.4	26.0	26.3	24.6	25.8	26.1	25.9	.57
Female.....	19.7	19.1	18.8	19.8	19.3	19.2	19.3	.81
Nonwhite.....	43.5	43.1	42.1	44.7	43.3	48.9	44.5	.0004
Male.....	49.8	47.1	46.6	49.9	48.3	55.2	49.8	.002
Female.....	37.0	39.0	37.4	39.3	38.2	42.5	39.1	.03
Under 4 weeks								
Total.....	19.1	19.2	18.8	18.8	19.0	19.7	19.1	.05
Male.....	21.9	22.1	21.6	20.9	21.6	22.5	21.8	.05
Female.....	16.1	16.0	15.9	16.5	16.1	16.8	16.3	.09
White.....	17.9	17.7	17.4	17.2	17.5	17.7	17.6	.52
Male.....	20.6	20.6	20.1	19.1	20.1	20.3	20.1	.67
Female.....	15.1	14.6	14.6	15.1	14.8	14.9	14.9	.81
Nonwhite.....	31.2	33.4	31.8	33.2	32.4	37.3	33.5	.0004
Male.....	36.0	37.0	35.6	37.0	36.4	41.4	37.5	.01
Female.....	26.3	29.8	27.9	29.3	28.4	33.2	29.4	.004
Under 1 day								
Total.....	10.0	10.4	10.3	10.3	10.3	10.5	10.3	.38
Male.....	11.2	11.7	11.9	11.1	11.5	12.0	11.6	.14
Female.....	8.8	9.0	8.7	9.5	9.0	8.9	9.0	.74
White.....	9.3	9.5	9.4	9.3	9.4	9.2	9.3	.38
Male.....	10.3	10.7	10.8	9.9	10.4	10.6	10.5	.55
Female.....	8.2	8.2	7.9	8.6	8.2	7.8	8.1	.19
Nonwhite.....	17.4	19.3	18.7	19.9	18.9	21.2	19.4	.02
Male.....	20.2	21.6	21.8	22.3	21.5	23.9	22.0	.10
Female.....	14.5	16.9	15.5	17.4	16.1	18.5	16.6	.06

<sup>1</sup> P=the probability that a difference as great as or greater than the observed difference between the 1958 rate and the 1954-57 average rate could occur due to chance alone. The test used was:

$$\frac{\text{difference}}{\text{S.E.}_{diff.}} = \frac{p_1 - p_2}{\sqrt{\frac{pq}{n_1} + \frac{pq}{n_2}}}$$

- where  $p_1$  = 1958 rate  
 $p_2$  = 1954-57 average rate  
 $p$  = 1954-58 average rate  
 $q$  = 1- $p$   
 $n_1$  = number of live births during 1958  
 $n_2$  = number of live births during 1954-57



**Table 1. Infant death rates and percentage change in rate: Pennsylvania, 1906-58 and the expanding birth registration area of the United States, 1915-58**

Period	Pennsylvania		United States	
	Rate per 1,000 live births	Percentage decrease from previous period <sup>1</sup>	Rate per 1,000 live births	Percentage decrease from previous period <sup>1</sup>
1906-09 <sup>2</sup>	145.8			
1910-14 <sup>2</sup>	123.2	15.5		
1915-19 <sup>2</sup>	112.7	8.5	95.7	
1920-24 <sup>2</sup>	88.4	21.6	76.7	19.9
1925-29 <sup>2</sup>	75.2	14.9	69.0	10.0
1930-34 <sup>2</sup>	60.6	19.4	60.4	12.5
1935-39 <sup>2</sup>	48.7	19.6	53.2	11.9
1940-44 <sup>2</sup>	40.3	17.2	42.4	20.3
1945	37.9	6.0	38.3	9.7
1946	33.0	12.9	33.8	11.7
1947	31.1	5.8	32.2	4.7
1948	28.4	8.7	32.0	6
1949	29.2	-2.8	31.3	2.2
1950	27.6	5.5	29.2	6.7
1951	26.0	5.8	28.4	2.7
1952	26.1	-.4	28.4	.0
1953	25.7	1.5	27.8	2.1
1954	24.9	3.1	26.6	4.3
1955	24.6	1.2	26.4	.8
1956	24.5	.4	26.0	1.5
1957	24.5	.0	<sup>3</sup> 26.4	-1.5
1958	25.5	-4.1	<sup>3</sup> 26.9	-1.9

<sup>1</sup> Minus sign means percentage increase over previous period.

<sup>2</sup> Average rate shown for period.

<sup>3</sup> Provisional.

NOTE: Rates shown for Pennsylvania prior to 1940 are based on live births and infant deaths occurring in Pennsylvania; after 1939 the rates shown are based on resident data.

SOURCES: National Office of Vital Statistics, Public Health Service, and for Pennsylvania data in all tables, statistical methods section, division of statistics and records, Pennsylvania Department of Health.

**Table 2. Infant death rates per 1,000 live births of Pennsylvania residents, by age at death, sex, and race, averages 1954-57 and 1954-58**

Sex and race	Average death rate 1954-57				Average death rate 1954-58			
	Total: under 1 year	Under 1 day	Under 1 week <sup>1</sup>	Under 4 weeks	Total: under 1 year	Under 1 day	Under 1 week <sup>2</sup>	Under 4 weeks
Total	24.6	10.3	16.7	19.0	24.8	10.3	17.0	19.1
Male	27.9	11.5	18.9	21.6	28.2	11.6	19.3	21.8
Female	21.2	9.0	14.3	16.1	21.3	9.0	11.5	16.3
White	22.7	9.4	15.4	17.5	22.7	9.3	15.5	17.6
Male	25.8	10.4	17.5	20.1	25.9	10.5	17.7	20.1
Female	19.3	8.2	13.1	14.8	19.3	8.1	13.2	14.9
Nonwhite	43.3	18.9	28.9	32.4	44.5	19.4	30.5	33.5
Male	48.3	21.5	32.3	36.4	49.8	22.0	31.2	37.5
Female	38.2	16.1	25.3	28.4	39.1	16.6	26.8	29.4

<sup>1</sup> Average rate 1956-57.

<sup>2</sup> Average rate 1956-58.

**Table 5. Nonwhite infant death rates per 1,000 live births by age among residents of Philadelphia and Allegheny Counties and the rest of the State, 1954-58, and averages 1954-57 and 1954-58**

Age at death and area	1954	1955	1956	1957	Average 1954-57	1958	Average 1954-58	P <sup>1</sup>
Under 1 year:								
Philadelphia.....	46.9	45.6	42.5	47.0	45.4	51.7	46.8	0.001
Allegheny.....	36.4	38.2	44.8	42.9	40.7	45.8	41.8	.16
Rest of State.....	39.0	35.3	39.1	38.1	37.9	42.9	39.0	.08
Under 4 weeks:								
Philadelphia.....	33.7	36.2	33.1	34.9	34.5	40.4	35.7	.001
Allegheny.....	29.2	32.6	33.8	32.2	32.0	35.2	32.7	.33
Rest of State.....	25.8	25.9	26.8	28.1	26.7	29.9	27.4	.19
Under 1 day:								
Philadelphia.....	18.3	20.6	19.6	21.1	20.0	23.2	20.7	.01
Allegheny.....	15.8	20.9	20.3	19.4	19.1	18.9	19.1	.94
Rest of State.....	16.0	14.1	15.1	16.3	15.4	17.1	15.8	.36

<sup>1</sup> P=the probability that a difference as great as or greater than the observed difference between the 1958 rate and the 1954-57 average rate could occur due to chance alone. - See table 3 for formula used to test significance of the observed difference.

than the nonwhite mortality levels during the previous 4 years. The State nonwhite mortality rate is determined to a large degree by mortality levels in two counties. Approximately 63 percent of the nonwhite births each year are to residents of Philadelphia and approximately 15 percent to Allegheny residents. The remaining 22 percent of nonwhite births occur in such small numbers when allocated to specific county of residence that analysis by individual county is not feasible. Table 5 indicates nonwhite infant, neonatal, and natal day mortality for Philadelphia and Allegheny Counties and the rest of the State for the period 1954-58. When the 1958 rates are compared with the 1954-57 mortality level, only the differences observed for Philadelphia are significant at each age level.

A detailed analysis of rates by county has not been attempted (other than that shown for Philadelphia and Allegheny) because the frequencies in most counties are so small that quite wide variation in annual rates can occur without being statistically significant. The infant death rate for the 45 nonmetropolitan counties was the same in 1957 and 1958 (table 6). Births in these counties are predominantly white and are only 22 percent of the State total. The 1958 rate for the 22 metropolitan counties is greater than the 1957 rate (26.0 and 24.8); however, several of the standard metropolitan areas show decreases in 1958.

When infant mortality by cause of death is

examined, it is found that the only noticeable change during the period occurs in 1958. This is a reduction in the number of deaths attributed to "other diseases of the lung and pleural cavity" and a corresponding increase in the number of deaths classified as "ill-defined diseases of early infancy." This is an artificial change due to a 1958 revision in the rules for coding causes of death under the provisions of

**Table 6. Infant death rate per 1,000 live births of residents of standard metropolitan areas of Pennsylvania, 1957 and 1958**

Area	1957	1958
State total.....	24.5	25.5
Nonmetropolitan counties (45).....	23.4	23.4
Metropolitan counties (22).....	24.8	26.0
Allentown-Bethlehem-Easton (Lehigh and Northampton Counties).....	20.5	22.8
Altoona (Blair County).....	22.8	29.4
Erie (Erie County).....	23.4	29.1
Harrisburg (Dauphin and Cumberland Counties).....	21.5	25.6
Johnstown (Cambria and Somerset Counties).....	28.6	23.8
Lancaster (Lancaster County).....	23.4	18.8
Philadelphia (Bucks, Chester, Delaware, Montgomery, and Philadelphia Counties).....	27.0	30.0
Pittsburgh (Allegheny, Beaver, Washington, and Westmoreland Counties).....	22.8	22.6
Reading (Berks County).....	22.2	22.7
Scranton (Lackawanna County).....	25.5	23.6
Wilkes-Barre and Hazleton (Luzerne County).....	25.8	21.7
York (York County).....	22.1	22.3

praisal of the 1958 infant death rate in relation to previous years can be made without an examination of the component parts of the rate on a sex, race, and age-specific basis.

In table 3 infant death rates by sex and race for each year 1954-58 and the average rates for the 4-year period 1954-57 and the 5-year period 1954-58 are indicated. A test of the significance of the difference between the 1958 rate and 1954-57 average rate was made for each sex-race class.

In the table,  $P$  is the probability that a difference as great as or greater than the observed difference between the 1958 rate and the 1954-57 average rate could occur due to chance alone. If  $P = 0.05$  or any smaller value is established as significant, as is conventional, the differences in the white rates of the magnitude observed could occur very frequently due to chance alone, while the nonwhite differences are large enough to be statistically significant. That is, it is very unlikely that 1958 nonwhite mortality is consistent with the 1954-57 nonwhite mortality level.

Comparable data for neonatal death rates (infants under 4 weeks) show similar results (table 3). The 1958 rates for white infants are not significantly different from the 1954-57 average, and the nonwhite rates differ significantly.

In natal day mortality, differences in the white rates again are not significant (table 3). The nonwhite differences are either significant or approach significance. However the probabilities shown indicate that these changes are considerably more likely to be due to inherent

variability than were the 1958 nonwhite rates at other age levels.

Table 4 indicates mortality rates of infants living less than 1 week. The differences tested in this table are between the 1958 rate and the average rate for 1956-57, because data for 1954 and 1955 were not classified to define infants living less than 1 week. The significance of the change in the nonwhite rates is comparable to that found for total nonwhite infant mortality and for nonwhite neonatal mortality. The difference in white rates is not significant, but the probability that differences of this magnitude are due to chance alone is much less than was found for white infant and white neonatal mortality.

These findings indicate that death rates of white infants (at each age level) for 1958 are not significantly higher than the average white mortality observed during the previous 4 years. Mortality of white infants for the 5-year period 1954-58 has been strikingly consistent, and it may be said that the white infant mortality rate has stabilized at a level of approximately 22.7 per 1,000 white live births. (This, of course, does not obviate further reduction of the rate by the application of the full potential of medical and health facilities.)

#### Area and Cause of Death

The 1958 nonwhite infant death rates (at each age level) were found to be significantly greater

**Table 4. Death rates of infants living less than 1 week per 1,000 live births of Pennsylvania residents, by sex and race, 1956-58, and averages 1956-57 and 1956-58**

Sex and race	1956	1957	Average 1956-57	1958	Average 1956-58	$P^1$
Total.....	16.7	16.7	16.7	17.6	17.0	0.004
Male.....	19.3	18.5	18.9	20.2	19.3	.006
Female.....	14.0	14.7	14.3	14.9	14.5	.15
White.....	15.5	15.2	15.4	15.8	15.5	.21
Male.....	18.0	16.9	17.5	18.2	17.7	.14
Female.....	12.8	13.4	13.1	13.2	13.2	.82
Nonwhite.....	28.1	29.6	28.9	33.8	30.5	.0001
Male.....	31.5	33.0	32.3	38.0	34.2	.004
Female.....	24.5	26.1	25.3	29.5	26.8	.02

<sup>1</sup>  $P$  = the probability that a difference as great as or greater than the observed differences between the 1958 rate and the 1956-57 average rate could occur due to chance alone. See table 3 for formula used to test significance of the observed difference.

# Some Ramifications of Air Contamination

JOHN H. LUDWIG, Sc.D.

THE PUBLIC EFFECT of air pollution, from the standpoint of general community interest and normal governmental regulatory procedures for the country as a whole, is probably the latest area to be added to the list of environmental influences of direct concern to man. No longer do we accept that the world's air resources are unlimited. In a very short period of time we have been brought face to face with a problem which can under proper conditions—or improper—result directly in impairment of health and even death. However, disregarding these spectacular occurrences, the problem is day by day becoming of increasing importance to the community, in that air pollution more and more is making its impact on the everyday living of man by its direct manifestations—eye irritation, visibility reduction, and plant damage, to name a few. More importantly, it poses the broader question of the long-term effects on health and causes one to ponder the future course of the battle between man's quest for a higher standard of living for increasing numbers of people and the garbage they produce. Let us take a brief look at some of the problems we have with us today, with some indication of the work cut out for us in the immediate future.

A statistical study of comparative mortality of 102 causes of death in 163 metropolitan areas in the United States has failed to establish a

disease entity for which air pollution could be cited as the sole cause (1). However, this study did suggest that air pollution in large industrial and population centers contributes in part to the incidence of primary cancer of the trachea, bronchi, lungs, and esophagus. The death rate from emphysema, nonoccupational tuberculosis, and arteriosclerotic heart disease also was considerably higher in metropolitan than in rural areas, but a causal relationship between community air pollution and these diseases has not been established.

Even so, there is still room for speculation along several lines. Repeated exposure to relatively low levels of air pollution may have a causal relation to the development of chronic degenerative diseases; the presence of well-known chemical carcinogens such as benzo-pyrene has been demonstrated in urban community air; extracts of particulate material obtained from a number of cities have produced skin cancer in mice; the irritant nature of air pollution may contribute to the development of cancer by inhibiting the body defense mechanism which normally would remove carcinogen-laden particulate matter from the lungs and respiratory tract; air pollution, as well as smoking, may be a contributing factor to the increasing incidence of lung cancer; in Great Britain there is a specific disease entity, chronic bronchitis, which seems specifically related to air pollution; certain pulmonary or cardio-respiratory diseases may be aggravated by interference with gas diffusion across the respiratory membranes during peak urban air pollution; certain air pollutants may combine with body proteins to form allergenic substances and lead to sensitization and allergic response; and

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*Dr. Ludwig serves as assistant chief of Air Pollution Engineering Research at the Robert A. Taft Sanitary Engineering Center, Public Health Service. The article represents the essence of a paper delivered before the 47th National Safety Congress and Exposition on October 20, 1959, in Chicago.*

the seventh revision of the International Statistical Classification of Diseases, Injuries, and Causes of Deaths. During 1954-57, deaths of infants from "hyaline membrane" were coded to "other diseases of the lung and pleural cavity," while in 1958 these deaths were assigned to "ill-defined diseases of early infancy."

The effect of this revision in coding instructions may be seen in the following table.

Cause	Number of infant deaths				
	1958	1957	1956	1955	1954
Other diseases of the lung and pleural cavity (code 527)-----	13	126	114	105	80
Ill-defined diseases of early infancy (code 773)-----	442	210	225	221	213

Other factors which affect infant mortality such as birth weight, birth order, and age of mother have not been analyzed in detail as have sex, race, and age at death. However it has been observed during this period that there has not been any material change in the proportional distribution of birth weights, birth orders, and ages of mother in the total birth population. The increase in the nonwhite death rate may very well be due to changes in the nonwhite birth population that are not apparent in the total population. Further study of the effect of birth weight, birth order, and age of mother, especially in the nonwhite segment, will be conducted when the 1959 data are available.

All of the rates shown are based on births and deaths occurring in the same year. It is unlikely that computation of these rates on a

cohort basis would affect the findings of this study because the number of white births each year has been fairly constant and the number of nonwhite births has increased only slightly each year. Under these conditions the relative difference in rate from year to year is much the same for each race group using either method of computation.

## Summary

An investigation of infant mortality in Pennsylvania at several age levels (under 1 day, under 1 week, under 4 weeks, under 1 year) during 1954-58 indicates that the white mortality rate has essentially stabilized and that the 1958 rate falls within the expected range of inherent variability associated with the average of the 1954-57 mortality level.

The difference between the 1958 nonwhite infant mortality and the 1954-57 average rate at each age level was found to be statistically significant; that is, it is highly unlikely that differences this great could occur due to chance alone. While the nonwhite rates increased throughout the State, only in Philadelphia County were the 1958 rates found to be significantly greater than the 1954-57 averages.

Infant mortality during 1958 in the standard metropolitan areas of the State increased slightly over the 1957 rate, while mortality in the nonmetropolitan counties was the same in both 1957 and 1958.

No real change in mortality from specific causes of death can be identified.

## Performance Standards for Health Agencies

Minimum standards of performance for local health departments will be put into effect by the Public Health Council of the New Jersey Department of Health on April 1, 1961. The council had previously prepared a list of recognized activities for health departments, recommended by a committee of local health officers in 1957. The same committee drafted the minimum standards of performance. Its recommendations were adapted with refinements after a public hearing. Copies are available from the New Jersey Department of Health.

A summary of the activities of the New Jersey Department of Health appears in its annual report, dated March 1, 1960.

tributor in direct relation to the increase in the total contribution can we expect to hold our own.

Next, consider the effects of particulate material in the atmosphere, and its effects on the community. In relation to our previous discussion on health, there are convincing laboratory data on animal studies which suggest that the physiological effects of irritant vapors are potentiated in the presence of aerosols. It has been proposed that the effects of air pollution disaster episodes were the result of the synergistic action of two or more atmospheric contaminants, one of which may well have been particulates.

The quantity of dirt contained in the atmosphere is expressed in terms of the sum of suspended material and that which settles out on a plane surface as settleable dust. Measurements made by the Public Health Service's National Air Sampling Network, comprising some 265 stations located throughout the Nation, indicate an alarming difference between the cleanliness of air over our cities, expressed in terms of suspended particulates, as compared with the rural areas. The latter in a broad sense might be considered the "background" level. The National Air Sampling Network collects suspended particulate matter by use of a High-vol sampler, wherein 70,000 cubic feet or so of air are sampled over a 24-hour period. Particulates varying in size from well below a micron to approximately 100 microns are retained on a glass fiber filter.

The results of sampling over the period 1953-57 (fig. 1) indicate a geometric mean particulate concentration over urban areas of 136 micrograms per cubic meter as compared with 33 for nonurban areas, or roughly four times as great (2). Since the distribution of samples is the same—that is, the standard geometric deviations are about equal as shown by the parallelism of the two plots, we can deduct the latter from the former and come up with a plot of "urban minus nonurban," which difference may then be considered as the contribution of urban living to pollution of the air—roughly 100 micrograms per cubic meter. In terms of the air we breathe, amounting to about 200,000 cubic feet of air yearly, the intake of dirt into our lungs attributable to urbanization

comes to about a half a gram per year, not an imposing quantity at first glance, but quite significant in terms of numbers of particles, surface area, penetration into the respiratory system, and chemical content.

Further analysis of these data (3) indicates that dirtiness and population size are related (fig. 2). Even the dirtiest of nonurban sites is much cleaner than the suburban or urban site categories. The 117 cities in the "less than 700,000 population" category are dirtier than their own suburbs, and cleaner than the 11 cities with more than this population. Coastal sites show a markedly different distribution of particulate matter attributable to a constant base of salt from sea sprays.

In terms of settleable dust, sampling over the years from several large cities shows the impact of control measures, but the curves level off indicating the limits imposed by the practicability and economics of further removal (fig. 3). Nonetheless, even for a relatively clean atmosphere with an average of 50 tons of dust per square mile per month, this amounts to about 5 pounds per year on a 9-foot by 12-foot rug, if we care for a comparison in terms of the housewife who is most aware of the annoyances connected with such dustfall.

Concerning the detailed analyses of suspended particulate matter collected by the National Air Sampling Network, a comparison of ratios of the organic fraction to the total particulate collected has been made. The ratio is essentially constant for all categories of stations and equal to about 7 percent of the total particulate. The following tabulation indicates a further breakdown of the organic fraction in terms of the well-known carcinogen, benzo [a] pyrene, for nine American cities in November 1958 (4).

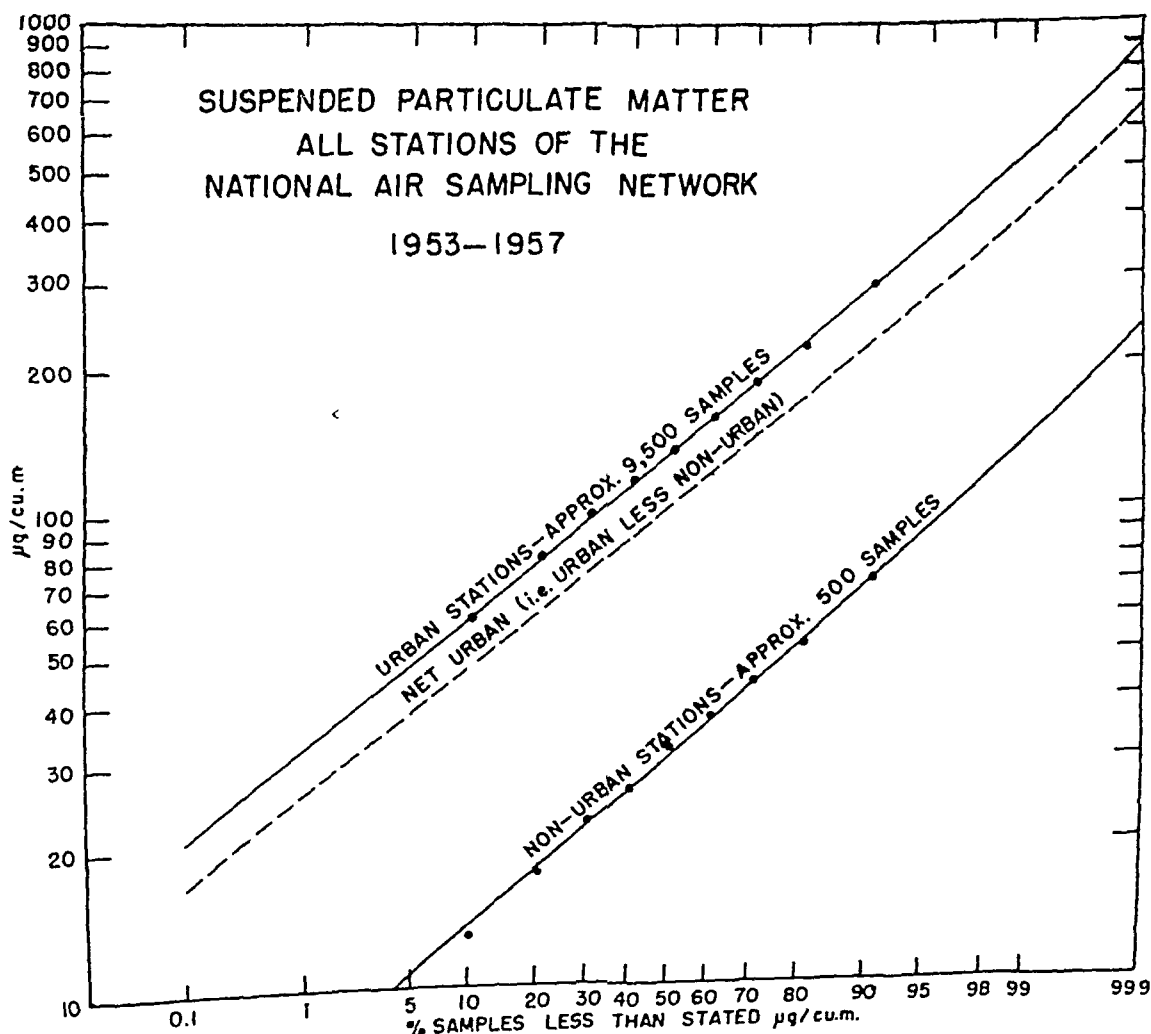
City	$\mu\text{g. BaP/gram}$ of particulate	$\mu\text{g. BaP/1,000}$ $\text{m.}^3$ of air
A -----	5.1	1.9
B -----	30.0	3.2
C -----	32.0	2.9
E -----	29.0	7.0
D -----	54.0	7.6
I -----	70.0	10.3
H -----	98.0	14.4
F -----	102.0	19.6
G -----	106.0	29.9

finally, there may be more than irritation of the eyes, nasal passages, and the respiratory tract associated with "Los Angeles type" smog, even though overall mortality rates in urbanized areas in California do not differ significantly from the rate in rural areas of that State.

This thumbnail report of the effects of air pollution on health is hardly detailed enough to really assess the problem. What it does serve is to point out that the effects of air contaminants are subtle and hidden, evidently seeking out first those whose resistance to stress is minimal—the very old, the chronically ill, and the young, exposed around-the-

clock and over the years. It behooves us to continue our efforts to seek and find the relationship of community air pollution to health, and until that time to take all reasonable measures to control pollutants in all of their forms and to the greatest extent economically feasible. Our desire for a higher standard of living resulting in increased industrialization and larger populations concentrated into urban complexes all adds up to larger quantities of air garbage going into the same atmosphere which is limited in its capacity by relatively unchanging topographical and meteorological conditions; only by reducing the quantity per con-

Figure 1. Cumulative frequency distribution of suspended particulate matter for all stations of the National Air Sampling Network, 1953-57



status, let alone effect additional cleanup beyond present levels.

So far we have given attention only to particulate pollutants in the air. Much less work has been done on general monitoring for gases and vapors on a national scale than for particulates; however, more intensive investigations have been made locally in connection with specific problems. Gaseous pollution problems have invariably been associated with combustion processes: the generation of power, basic metals production, industrial processing, waste disposal, or the operation of family automobiles and house heating. All of us are contributors in direct relation to the type and quantity of fuels we use and the combustion efficiency of the equipment used. In this latter context we refer to total destruction of organic fuels to their basic combustion products—carbon dioxide and water—not merely the recovery of the heating value of the fuel.

Sulfur dioxide has long held the stage as a

universal air pollutant. When one considers that coal, the major source of  $\text{SO}_2$ , will continue to be the major source of fuel in the world for some time to come and that vastly larger quantities will be consumed, the picture is not promising, especially in the light of general downgrading in the quality of coal. The trend toward conversion to gas as a fuel source, particularly in the home, and the centralization of coal use for power development in large installations, where combustion is efficient and control is most feasible, promises some improvement. The ultimate solution rests, however, with the development of an economical means for sulfur dioxide removal from flue gases. This is being worked on.

The photochemistry of atmospheric reactions which take place among pollutants after their discharge to the atmosphere opens a whole new field for investigation. Hydrocarbons in general, and in particular the more reactive species, such as olefins, together with nitrogen oxides,

Figure 3. The trend in atmospheric settleable dust loadings for four American cities

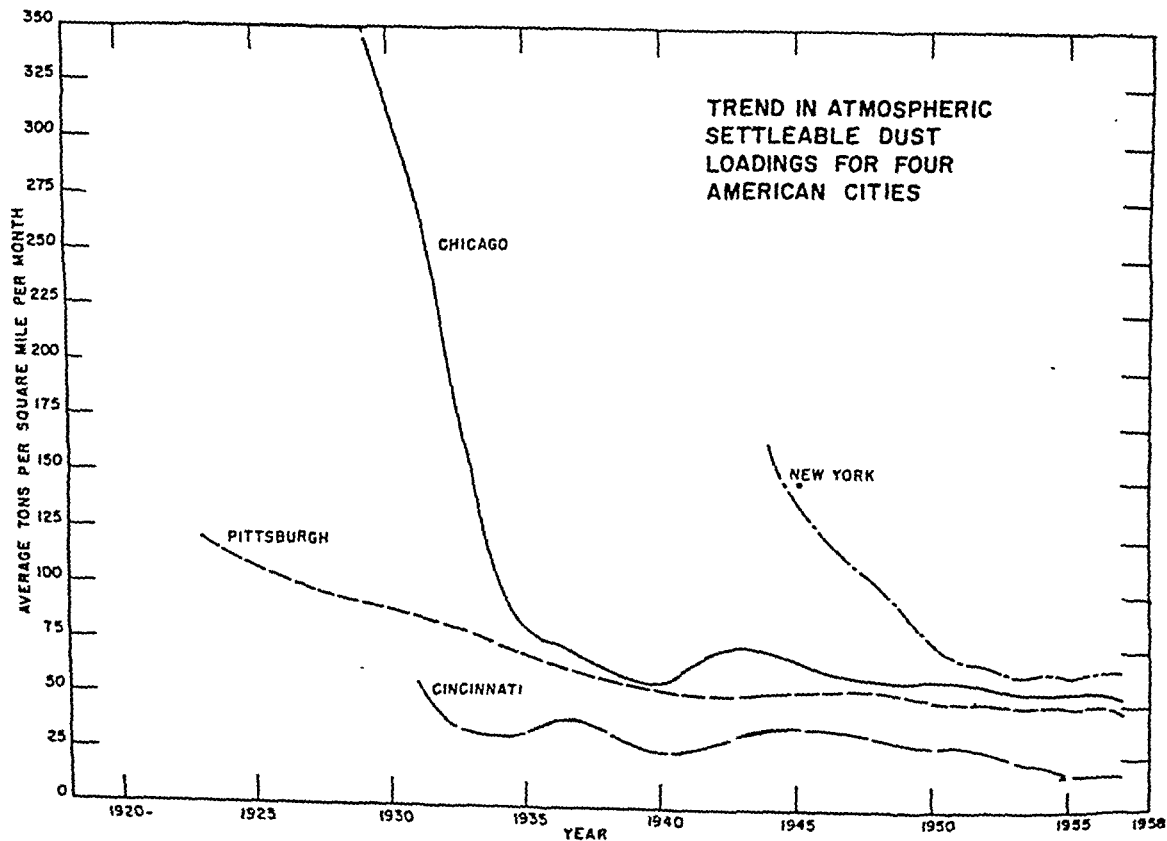
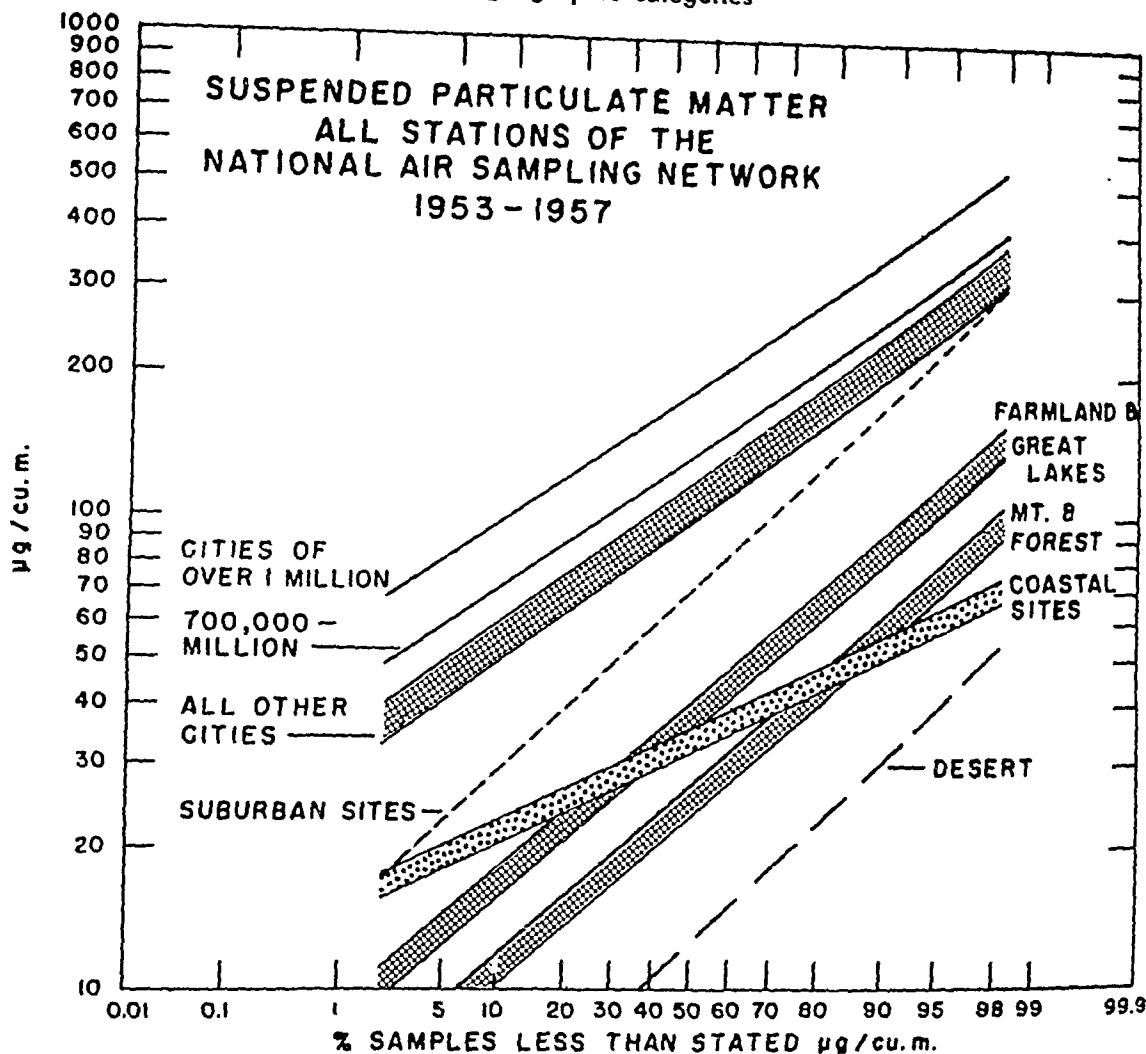




Figure 2. Cumulative frequency distribution of suspended particulate matter by population and geographic categories



Plots of the spectra of chromatographic fractions from a large number of air particulate samples indicate that the concentration of benzo[a]pyrene denotes an increase in the concentration of other well-known polynuclear hydrocarbons including the possibility of other polynuclear carcinogens (fig. 4). The peaks at 377, 379, and 382 millimicrons indicate the presence of benzo[a]pyrene, at 401, benzo[k]fluoranthene, at 434, perylene, and at 330, benzo[a]pyrene.

The significance of these data on suspended particulates and settleable dust lies not only in the quantitative amounts and the influence of urbanization and associated industrialization but in the trends which are indicated. Cer-

tainly we expect an increase in urbanization, now estimated to be in direct numbers equal to the Nation's increase in population. This means more and larger cities with a direct increase in the activities necessary to support these populations, both domestic and industrial. Added to this are the waste problems associated with increased per capita production that is inherently coupled with improved standards of living. When these trends are viewed from the standpoint of removal efficiencies for particulate control equipment, the result is even more significant. It is the residual which passes through control devices which must be reduced in direct proportion to the increase in total contribution if we are to even maintain the present

- (2) U.S. Public Health Service: Air pollution measurements of the National Air Sampling Network, analysis of suspended particulate samples collected 1953-1957. PHS Pub. No. 637. Washington, D.C., U.S. Government Printing Office, 1958.
- (3) Stern, A. C.: Changes in identity and quantity of pollutants, past, present, and future. *In* Pro-

ceedings of the National Conference on Air Pollution. Washington, D.C., November 18-20, 1958. PHS Pub. No. 654. Washington, D.C., U.S. Government Printing Office, 1959, pp. 86-99.

- (4) Sawicki, E., et al.: The detection and determination of polynuclear hydrocarbons in the air particulates of nine American cities. *International J. Air Pollution* 2: 273-282, March 1960.

## Environmental Radiation Studies

The first two studies of a nationwide series aimed at determining the effects of environmental radiation on the health of large population groups have been initiated by the Public Health Service in cooperation with State and local health authorities. One study will involve residents of San Juan County, N. Mex. The second will focus on the St. Louis, Mo., region, beginning with the St. Louis milkshed.

The locality for the San Juan study is one of the largest uranium producers in the country. Earlier studies have shown that radioactivity from radium in the surface water of the Animas River has been higher than that found in most areas in the United States.

Effective steps have been taken recently to reduce the amounts of radioactive waste discharged into the rivers of this locality. However, extensive data have already been obtained on radioactivity in this environment. Consequently, the area presents an unusually good opportunity for further study to determine the amounts of radioactivity in the elements currently being taken in by people, the amounts of radioactivity they retain, the total "body burden," and the effects upon their health.

In the current project detailed medical and laboratory examinations will be given approximately 100 families totaling about 400 individuals. Teams of Federal and State physicians, nurses, and technicians will obtain complete medical histories of each individual in the cooperating families and determine a typical week's diet. Exact duplicates of typical diets will be analyzed to determine the amount of radioactivity taken in. Body wastes and breath samples will be collected and analyzed to

determine the amount of radioactivity excreted.

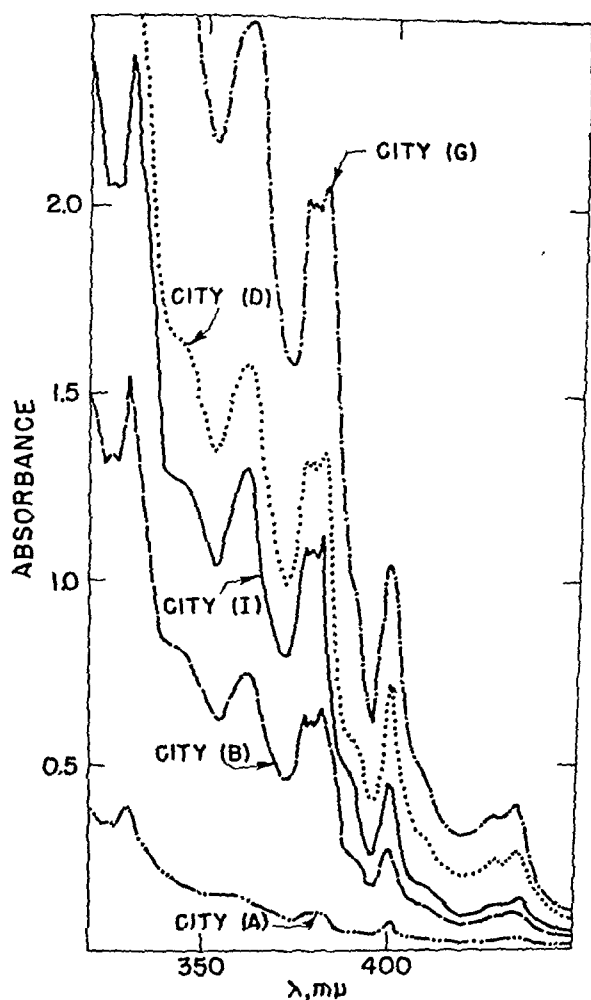
Exhaustive study will also be made of the vital statistics of the area. Some aspects of the project will require followup interviews, medical examinations, laboratory studies, and statistical analyses extending for several years. In the near future, this study will be applied to other areas along the Animas and San Juan Rivers.

The St. Louis study seeks to determine the significance of previous findings concerning radiation levels in the area and, in its initial phase, whether previous strontium 90 findings obtain throughout the entire St. Louis milkshed, or only part of it. Though the levels of strontium 90 have been somewhat higher in the St. Louis milkshed than elsewhere, average levels for St. Louis have been below those which the National Committee on Radiation Protection and Measurements considers permissible for lifetime exposure by the general population.

A preliminary survey of dairy farms in the various milksheds serving St. Louis will consist of investigations of water supplies, sources of animal food, climate, farming and animal feeding practices, and other variables that may be associated with different types and levels of radioactivity in milk. The final phase of the milkshed study will consist of field experiments to determine whether, if necessary, the radioactive content of milk can be reduced by modifications in dairy farming practices.

Techniques developed in the St. Louis study will be applied to similar milkshed investigations being planned for several other major metropolitan areas in the United States.

Figure 4. The ultraviolet-visible absorption spectra in pentane of some benzopyrene chromatographic subfraction for five American cities



are at present the major suspects in the fight against "Los Angeles type" smog, with the role of sulfur dioxide and particulates still neither clearly indicted nor exonerated. The intensive endeavors of the past 10 years have increased immensely our store of knowledge of what is happening and how to measure it, but at the same time have broadened the vistas as to possible offending precursor agents and their interactions. The concept of a universal photolyzed reaction product responsible for all effects—eye irritation, plant damage, and visibility reduction, to name the major ones—is giving way to the notion that perhaps different products or

families of products are responsible for the various effects, and that these products may have various modes of formation depending on the vagaries of the precursors, accumulation resulting principally from meteorological conditions, and sunlight conditions.

Next, what are some of the community effects of air pollutants which directly result in economic loss roughly estimated to be around \$2 billion or about \$10 per capita annually? These have been listed many times by many authors, and comprise the gamut from additional cost of soap in the home to depreciation of property values. To name a few we have the extra cost of such household expenses as more frequent laundering, cleaning, redecorating, and replacement of furniture, clothing, and other household or personal materials; similar additional costs in commerce and industry, including more rapid deterioration of products and foodstuffs; increased costs of structural maintenance reflected in cleaning, painting, renovation, and replacement; reduction in life of various types of machinery due to both gaseous and particulate pollutants; increased use of artificial lighting due to reduction in light intensity; the necessity for increased use of air filtration equipment for protection of health or production of special equipment; increased expenses for navigational equipment at municipal airports due to increased visibility restriction by pollutants; additional medical expenses due to both increased irritation of the mucous membranes and accidents attributable to pollution; and finally, as previously mentioned, the added cost of accelerated property deterioration. Indirectly, communities, or the people who live in them, encompassing the major portion of the population, must bear the added expense of services or products required to offset the effects of air pollution. This would include such items as increased costs of agricultural products, both vegetable and animal, due to air pollution.

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sive classification, mental health authorities have estimated that some 790,000 beds, approximately one-half the beds in all hospitals in this country, are now occupied by mental patients. Despite this staggering overall total, the States report that, using the present formula of 5 beds per 1,000 population, an additional 421,000 beds for mental patients are required.

State agencies have also emphasized that many of the existing facilities do not permit the use of modern techniques and improved treatment methods in mental care.

Some of the complicating factors which confront planners of mental health facilities were stated by the Surgeon General when he appointed the ad hoc committee.

"In the past," Dr. Burney said, "emphasis was placed on providing large institutions for the care of the mentally ill. Treatment now being offered includes outpatient and emergency service through hospital clinics or mental health centers, increased use of general hospitals for the treatment of psychiatric patients, 'halfway houses,' and nursing homes."

The Surgeon General explained that an adequate program stresses continuity of care and requires a wide spectrum of services, both community based and hospital oriented.

"If social and family ties are not to be weakened, the patient should be treated as near home as possible, even if hospitalization is indicated," Dr. Burney said.

The report, which was read at both conferences, included the following proposed principles for use in developing statewide plans:

- Facilities for the mentally ill, both as to location and type, should be programed and constructed in accordance with a comprehensive statewide plan which provides for a coordinated pattern of service.

- Statewide planning for mental health should represent a joint effort by State and local, public and private agencies concerned with mental health.

- In the interest of providing more effective service to more people, facilities should be designed and utilized to serve multiple needs, when this is consistent with sound treatment practice.

- Construction design should be flexible, to permit future expansion or modification to

other uses, particularly in psychiatric units of general hospitals.

- Treatment should be suited to the patient's need and the patient should be referred to the facility most appropriate to his need. Greater emphasis should be placed on continuity and progressiveness of care.

- Programs for mental health should place increasing emphasis on prevention, early recognition, and early treatment of mental illness.

- Construction of new facilities should be based upon the current concepts of treatment and expected future development.

- Facilities for treatment should be located in terms of easy accessibility to the area of potential need.

- Facilities should be used for the purpose for which programed and staffed, and at the highest levels of efficiency.

- Higher priority should be given to a mental health facility which is a part of or closely affiliated to a general hospital or health center, and to a new facility rather than to a proposal for remodeling an existing facility.

- Increased emphasis should be placed on rehabilitation of the mentally ill and preparation for complete return to home and society at the earliest feasible time.

- Long-term custodial care in mental institutions should be prescribed only as indicated following application of intensive treatment techniques.

- Provision of care and treatment to the senile aged, mentally retarded, and emotionally disturbed should be considered as a part of the State and local mental health program.

The report was read by Dr. Bernard Bucove, director of health, Washington State Department of Health, at the meeting of hospital and medical facilities survey and construction (Hill-Burton) authorities on January 5, and by Dr. Harold L. McPheeters, commissioner of the Kentucky State Department of Mental Health, Louisville, at the mental health authorities' meeting on January 6.

In addition to Bucove and McPheeters, other committee members are:

Dr. John J. Bourne, executive director, New York State Joint Hospital Survey and Planning Commission, Albany; Dr. Dale C. Cam-

## Planning Mental Health Facilities

**R**ECENT advances in methods of diagnosis, treatment, and care of the mentally ill present a complexity of problems not only to psychiatrists but to planners of medical facilities as well.

This fact was borne out in a report presented at the Washington conferences of both State Hill-Burton authorities and State mental health authorities called by Surgeon General Leroy E. Burney in January 1960. The report was an account of the activities of an ad hoc committee appointed last August by Dr. Burney. The committee's objective was to plan an attempt to overcome a long-felt need for more adequate facilities for the mentally ill.

Hill-Burton State authorities report that by far the Nation's greatest need for hospital beds continues to be in mental hospitals, on the basis of currently accepted standards. A solution to this crucial bed shortage becomes even more compelling in view of the prediction by mental health authorities that one out of every 10 persons will spend some part of his life in a mental hospital, if current patterns of admission to mental hospitals and current death rates remain constant. This means that about 17 million persons now living in the United States will be hospitalized for mental illness at one time or another, unless new techniques of treatment and cure are developed.

But the committee found that although the seriousness of the bed shortage is unquestionable, the problem will not be resolved by simply meeting the need for hospital beds. Indeed, some facility planners even question whether any additional beds are required until the Na-

tion's entire mental illness picture is thoroughly examined and reevaluated. They believe that broad-scale decisions should await the results of a study of the nature and availability of the physical facilities needed for a comprehensive program of treatment and care. Some authorities even question the formula of 5 beds per 1,000 population, which is now used as a guide in determining the number of beds needed in mental hospitals.

The committee pointed out that in view of new treatment methods, facility requirements may take on a completely new dimension. As an example, it was noted that many senile patients might be transferred appropriately to nursing homes and the beds they now occupy could be used by the mentally ill in need of special hospital care.

The current trend of general hospitals "to become more general" by providing care for the mentally disturbed was commended by the committee. It was stated that this trend should be encouraged since a mentally ill patient when admitted to the general hospital receives therapeutic care at a time when such care is most important. Also, from the standpoint of social attitudes, many mentally disturbed patients would be less reluctant to enter a general hospital than a mental institution.

As of January 1960, Hill-Burton State agencies reported a total of 542,000 mental hospital beds throughout the Nation. This figure includes beds in mental hospitals and in psychiatric units of 10 or more beds in general or tuberculosis hospitals, but does not include beds in Veterans Administration hospitals, Public Health Service hospitals, and other Federal facilities. Of this number, some 92,000 beds, or 17 percent, were designated as unsuitable by the State agencies. On the basis of a more inclu-

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*Prepared by J. J. Ozog, chief of the State Plan and Plan Development Section, Division of Hospital and Medical Facilities, Public Health Service.*

*A preliminary summary of the results of cytological examinations on 600,000 women indicates the efficacy of widespread use of cytology to detect cancer of various organs.*

## Uterine Cytology

RAYMOND F. KAISER, M.D., MARY M. BOUSER, R.N.  
SAMUEL C. INGRAHAM II, M.D., and ALBERT W. HILBERG, M.D.

**T**HE USE of exfoliative cytology to detect cancer of the uterus is now accepted in many areas of this country. Eight years ago, only a few thousand women were receiving an annual uterine cytology examination. Now it is estimated that each year more than 3 million women receive cervical cancer examinations using the cytological method.

The recognition of exfoliative cytology as a practical means of detecting early cancer of the uterine cervix was preceded by years of research. Among those groups responsible for the widespread acceptance and employment of the technique is the National Cancer Institute, whose investigators have pioneered in the application of cytology to detection of human cancer in large population groups.

The institute was one of the first agencies to recognize the potentialities of the cytological work of Papanicolaou, Traut, and others whose reports had been largely overlooked by pathologists and clinicians until after World War II. At that time, institute investigators

were evaluating a number of cancer "tests" described in the literature, and the cytological method was one of the few that appeared to merit further investigation.

In 1947, scientists of the National Cancer Institute established a study at Hot Springs, Ark., to evaluate the cytological technique as an aid to diagnosis of cancer of the uterine cervix. In the process of testing the method on women admitted to the venereal disease center, the investigators satisfactorily resolved many problems relating to the administration of such projects and provided some direction to basic problems of human cancer which may be studied using exfoliative cytology. On the basis of this experience, 4 years later the institute moved the project to Memphis, Tenn., to determine the practicality of vaginal cytology as a general population study procedure and to gather epidemiological information.

Preliminary data encouraged the establishment and operation of several other uterine cytology projects in order to develop new methods and techniques, investigate pathogenesis, and improve epidemiology procedures. These were set up at Columbus, Ohio; Louisville, Ky.; Madison, Wis.; New York, N.Y.; Philadelphia, Pa.; San Diego, Calif.; Washington, D.C.; Providence, R.I.; Detroit, Mich.; and Charlotte, N.C. Some of the projects have been directly administered by the institute, while others have been operated through grants to universities and medical schools. In each

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*Dr. Kaiser is chief of the Field Investigations and Demonstrations Branch, National Cancer Institute, Public Health Service, Bethesda, Md. Miss Bouser, nursing consultant of the Cytology Section, presented this paper at the Inter-Society Cytology Council meeting at Detroit, November 19-20, 1959. Dr. Ingraham is acting head of Diagnostic Development Activities, and Dr. Hilberg is acting head of the Cytology Section.*

eron, director, division of medical services, Minnesota State Department of Public Welfare, St. Paul; Dr. R. L. Cleere, director, Colorado State Department of Public Health, Denver.

Dr. Terrell O. Carver, administrator, Idaho Department of Health, Boise; Dr. Hiram W. Davis, commissioner, Virginia State Department of Mental Hygiene and Hospitals, Richmond; Herbert G. Fritz, chief, division of hospitals, Maryland State Department of Health, Baltimore; Dr. Stewart T. Ginsberg,

commissioner, division of mental health, Indiana State Department of Health, Indianapolis.

Dr. Jack C. Haldeman, chief, Division of Hospital and Medical Facilities, Public Health Service, Washington, D.C.; Dr. Robert T. Hewitt, chief, Hospital Consultant Services, Community Services Branch, National Institute of Mental Health, Bethesda, Md.; and Mrs. Louise Waagen Masters, director, division of hospital facilities, New Mexico Department of Public Health, Santa Fe.

## Fewer Resident Patients of Public Mental Hospitals

The number of resident patients in public mental hospitals in the United States decreased during 1959, for the fourth consecutive year, according to statistics from the National Institute of Mental Health, Public Health Service.

At the end of the 1959 calendar year, there were 542,721 patients in 277 hospitals, 2,142 fewer patients than at the end of 1958. This decrease of 0.4 percent compares with a decrease of 0.7 percent during 1958, 0.5 percent during 1957, and 1.3 percent during 1956.

While the decline each year has been slight, it reverses a decided upward trend that had prevailed through this century. Between the years 1903 and 1951, the public mental hospital population quadrupled from 133,000 to 518,000. During the same period, the general population only doubled. The upward trend continued until 1956. Since then there has been a steady slight decline in the number of patients at the end of each year, even though the number of admissions during the year has continued to rise. Total admissions increased by 4.3 percent, 4.8 percent, 7.7 percent, and 6.5 percent in 1956, 1957, 1958, and 1959, respectively.

During 1959, there were 167,607 discharges as compared with 156,352 in 1958, an increase of 11,255 or 7.2 percent. In the three previous years, the number of discharges had increased by 11.8 percent in 1956, 8.9 percent in 1957, and 7.7 percent in 1958. The percentage change in the number of deaths as compared with the previous years was 8.6 percent in 1956, -2.9 percent in 1957, 9.5 percent in 1958, and -3.2 percent in 1959.

Commenting on the findings, Dr. Robert H. Felix. Director of the National Institute of Mental Health, pointed out that many factors are involved in these figures. It is unsafe to draw specific conclusions from them, he said, but they undoubtedly reflect a prevailing improvement in the care and treatment of the mentally ill both in and out of mental hospitals. He attributed this improvement, in part, to a basic change in the philosophy governing hospital administration and treatment in the past few years, and also in the public attitude toward mental illness. No longer is the hospital viewed as a custodial institution, he said. Its function is seen as rehabilitating the patient so that he can return to community living. Communities are assuming more responsibility and are providing preventive and rehabilitative services that help keep people out of mental hospitals.

Dr. Felix also credited new and improved treatment methods, including the wide use of psychoactive drugs, to the increased use of psychiatric beds in general hospitals, and to outpatient psychiatric clinics and other community facilities such as nursing homes, halfway houses, and sheltered workshops. He noted that 20 years ago, there were only 48 general hospitals treating psychiatric patients. Today there are some 500 with psychiatric units and many others that accept mentally ill persons for short-term treatment. Altogether, 1,000 or more general hospitals accept mentally ill patients. There are about 1,400 outpatient clinics offering psychiatric service within communities.

invasive carcinoma. Certain fundamental questions concerning this relationship have been summarized previously (1):

- Do all invasive cervical cancers begin as intraepithelial lesions?
- What proportion of intraepithelial lesions progress to invasive lesions?
- What is the time required for an intraepithelial lesion to progress to invasiveness?
- Do some intraepithelial lesions regress and disappear spontaneously?
- Is it possible for an intraepithelial lesion to remain noninvasive indefinitely?
- What are the age-specific incidence and prevalence rates of carcinoma-in-situ and invasive carcinoma?

Table 3, which is compiled from published material, shows considerable variation between studies in the proportion of intraepithelial and invasive cervical carcinomas found at first examination. Further analysis may reveal that this variation is due to different epidemiological factors in the separate study groups.

The women screened in the Madison study (2) were predominantly rural residents examined by their private physicians. The group was comprised of women 20 years of age or over, and included only a few Jewish or Negro women. The investigators suggested that the particularly high prevalence rates for invasive cervical cancer in Madison indicated that the physicians taking the smears were selecting women with suspected lesions. They reported, however, that the more recent trend has been to examine larger numbers of asymptomatic women, with a concomitant decrease in the percentage of total malignant tumors detected and a relative increase in the number of intraepithelial carcinomas discovered.

The study group in Hot Springs (3) included females in the cancer-age group who were admitted to the venereal disease center. The minimum age was sometimes 35, sometimes 40, in this study, and the study group was 93 percent Negro.

Dunn and his associates (4) reported that over two-thirds of their study group were patients of gynecologists and obstetricians, and the remainder were examined by other private physicians in metropolitan San Diego. The minimum age was 15 years, and relatively few

**Table 3. Uterine cancers diagnosed microscopically following first cytological examination**

Project	Number screened	Cancer of the cervix	
		Intraepithelial	Invasive
Memphis.....	108, 136	393	373
Madison.....	65, 163	206	335
Columbus.....	37, 540	31	52
San Diego.....	33, 746	259	77
Louisville <sup>1</sup> .....	12, 000	41	60
Hot Springs.....	3, 224	32	35

<sup>1</sup> SOURCE: W. M. Christopherson and J. E. Parker: Cervical cell studies. A method of increasing production. J.A.M.A. 108: 1718-1719 (1958).

women over 50 were examined. The women were white and gentile.

In Columbus (5), 73 percent of the study group were examined by private physicians; the remainder were examined in various clinics. In their preliminary report, Ullery and his co-workers did not discuss age or race, except to state that the minimum age was 20 years.

Erickson and others (6) reported that their study patients, all 20 years of age or older, were examined in health department and hospital clinics, or in temporary clinics set up in industrial and business concerns, or by physicians in private practice. Approximately 13 percent of the women examined were not residents of Shelby County, the designated test area, but were women who came to Memphis physicians for medical care and were therefore a selected group such as will be found in any hospital sampling. Of the 373 women with invasive uterine cancer, 36 percent were nonresidents. However, the rate of occurrence of intraepithelial carcinoma was similar for residents and nonresidents, as would be expected for an asymptomatic, unsuspected lesion. The authors also found that whereas one-third of the surveyed population were Negroes, two-fifths of all the intraepithelial carcinomas found were among Negroes.

#### Rate Comparisons

The Memphis study produced a casefinding rate 40 times that observed in the community



situation there has been a high degree of co-operation with local health and medical groups and with individual physicians and pathologists.

The goal of the program is the cytological examination and evaluation of no fewer than 700,000 women tested once, 210,000 tested a second time, and 70,000 tested three times. It would be preferable, of course, to reexamine a larger percentage, but experience to date indicates that 30 percent is the best yield that can be expected on return examinations. At present, more than 600,000 women have been examined at least once.

### A Single Research Experience

Although the women studied represent a number of widely separated population groups, certain uniform procedures and standards make it possible to view the entire group as a single research experience.

In all cases, the fixation and staining of the slide material have been accomplished by using the Papanicolaou technique. Examination of the smears for malignant cells or for evidence of abnormal cellular changes has followed the procedure originally established at Memphis. This system, referred to as a "pyramid," features step-by-step screening of smears by increasingly competent and experienced technicians, and final interpretation of suspicious smears by a pathologist.

All the projects have employed a standard code system of reporting data to a single evaluation center. The coded information includes patient identification, cytological examination and biopsy results, clinical or surgical findings, and data necessary for proper clinical evaluation and epidemiological study. In order to assay epidemiological factors in cancer of the uterine cervix, a record has been made of each patient's age, race, geographic location, marital status and pregnancy history, socioeconomic status, and ethnic or religious status.

There are, of course, some variations in procedure. The techniques for obtaining material for cytological examination include vaginal aspiration, cervical scraping, and cotton swab wiping, accomplished by using glass or plastic pipettes, plastic "straws," or wooden spatulas

or applicators. The specimens were collected by physicians, nurses, or medical or nurses' aides.

### Some of the Findings

Thus far, 608,200 women have been examined the first time. Their laboratory smear reports are indicated in table 1. The designation "unsatisfactory" may refer to insufficient material on the smear, inadequate staining, loss of material, or breakage of the slide before interpretation. "Negative" smears are considered totally negative for cancer, and "atypical" indicates those smears that are negative for cancer but indicate some sort of epithelial cell abnormality. "Suspicious" means the smear shows some cells which may indicate the presence of cancer. Finally, "positive" indicates definite evidence of cancer.

By using raw, unpublished data, it has been possible to compute gross rates for various kinds of cancer found in the first examination of the entire group (table 2). Consideration of the number of intraepithelial cancers of the cervix compared with the number of invasive cancers of the cervix may shed some light on the relationship of intraepithelial carcinoma to

Table 1. Results of first cytology examination of 608,200 women

Result	Number examined	Percent
Unsatisfactory.....	5,660	0.9
Negative.....	578,640	95.2
Atypical.....	18,430	3.0
Suspicious.....	4,010	.7
Positive.....	1,460	.2
Total.....	608,200	100.0

Table 2. Proved cancers detected as a result of first cytological examination of 608,200 women

Type of uterine cancer	Number patients	Rate per 1,000
Intraepithelial carcinoma of cervix.....	1,490	2.45
Invasive carcinoma of cervix.....	910	1.50
Cancer of corpus.....	130	.21
Cancer of other sites of female reproductive tract.....	55	.09

Therefore, the scientists concluded that their method seems to fulfill the requirements of a practical procedure for processing samples of blood containing tumor cells found in individual patients affected with various types of cancer. Further study (8) established that a high percentage of cancer patients have malignant cells that appear to be viable circulating in the bloodstream. The authors noted that their results suggest that examination of peripheral blood may be justified for the establishment of a primary diagnosis of cancer in suspected cases that have eluded diagnosis by other means. The technique may also be of value in following patients after operation to indicate the presence of unsuspected metastases and in determining if manipulation of a tumor at the time of operation actually causes a "spraying" of malignant cells into the bloodstream. Further evaluation of the method is in progress.

Cytology is also being applied toward the detection of cancers of various specific sites other than the cervix, particularly the lung, genitourinary system, and gastrointestinal tract.

Considerable work is being done on the cyt analyzer (9), an electronic device designed to speed the examination of specimens obtained in the cytological test for uterine cervical cancer. This instrument has been found capable of accurately selecting a significant percentage of specimens that need not be examined further by cytotechnicians or pathologists. Research to improve its operation goes forward steadily. Emphasis is being placed on improving its accuracy and making more of its operations automatic with such developments as a self-focusing device and a mechanical slide feed, now in the research stage. It seems likely that the cyt analyzer can be modified for use in the examination of cytological specimens obtained from other parts of the body.

## Summary

Exfoliative cytology has gained a wide and favorable reputation as a means of detecting cancer of the uterine cervix.

The National Cancer Institute continues a vigorous cytology research program, aimed at gathering information on the natural history of uterine cancer, use of cytology in the study of malignant cells in circulating blood, and perfecting methods of applying cytology to the detection of cancer of other body sites, such as the lung, genitourinary system, and gastrointestinal tract.

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prior to the establishment of the project. Among the 108,136 women examined the first time, 60.4 percent, or 463 of the 766 cases of invasive uterine and intraepithelial cervical carcinoma found, were unsuspected. Of the 393 cases of intraepithelial carcinoma, 90 percent were unsuspected; 30 percent, or 112, of the 373 cases of invasive carcinoma were unsuspected. In addition, 20 cases of extrauterine genital cancer were found. These cases are not included in this analysis.

In Columbus, of the 99 patients found to have cancer of the genitalia—intraepithelial and invasive cancers of the cervix, and cancers of the corpus uteri, vagina, and ovary—69 percent had cancers that were previously unsuspected.

The Madison investigators reported that 74 percent of the confirmed cases of intraepithelial cancer of the cervix were not clinically detectable. The opposite relationship was evident for invasive cancer; that is, 73 percent were clinically suspected.

Table 4 compares the casefinding rates reported for first and second screenings in Memphis, Madison, and San Diego. Erickson and his associates reported that of each 1,000 women examined in the first screening, 3.6 were found to have intraepithelial carcinoma and 3.4 invasive cancer of the cervix. In the second screening, of each 1,000 women, 2.2 had intra-

epithelial carcinoma and 0.3 had invasive cancer of the cervix. The investigators suggested that adjustments for age and race differences in the two groups would probably show even greater reductions in casefinding rates. It is reasonable to expect that such adjustments in the Memphis data, and similar adjustments in the data for Madison and San Diego, would help to clarify the relationships between intraepithelial and invasive carcinoma.

### Other Research in Cytology

The Cancer Institute's vigorous cytology research program is aimed not only at gathering much needed information on the natural history of uterine cervical cancer, but also at investigating other promising applications of the cytological technique.

A group of institute scientists have described a technique for preparing human whole blood so that it can be examined cytologically for the presence of malignant cells (7). They had previously become aware of the importance of determining whether cancer cells circulate in the peripheral blood of individuals some time before metastasis or generalized spread occurs. Such a finding might be highly valuable in cancer diagnosis or in predicting whether or not an individual cancer would be likely to spread.

Table 4. Comparison of uterine cancer rates in first two examinations

Project and examination	Number examined	Intraepithelial carcinoma		Invasive carcinoma	
		Number	Rate per 1,000	Number	Rate per 1,000
<i>Memphis</i>					
First.....	108, 136	393	3. 6	373	3. 4
Second.....	32, 728	72	2. 2	9	. 3
<i>Madison</i>					
First.....	65, 163	206	3. 2	335	5. 1
Second.....	9, 111	10	1. 1	4	. 4
<i>San Diego</i>					
First.....	33, 746	265	7. 8	78	2. 3
Second: <sup>1</sup>					
Class 1.....	9, 109	23	<sup>2</sup> 1. 6	2	. 2
Class 2.....	616	11	<sup>2</sup> 13. 8	0	. 0

<sup>1</sup> For second examination, women were classed 1 or 2 according to the results of their first examination. Classes 1 and 2 indicate that the women showed no changes suggestive of cancer in the first examination and that tissue studies were not recommended.

<sup>2</sup> Adjusted by original author for person-years of experience.

# Murine Typhus Investigations in Southwestern Georgia

G. J. LOVE, M.P.H., and W. W. SMITH, Ph.D.

EFFORTS to control murine typhus fever in the southeastern United States, although overshadowed by accomplishments in the control of malaria, have achieved results which are almost as spectacular. An outstanding reduction of murine typhus transmission was accomplished within 25 years after the role of the rat and rat flea as host and vector of murine typhus was first suggested by Maxcy in 1926 (1) on the basis of epidemiological studies in Alabama and Georgia and validated in 1931 by Dyer, Rumreich, and Badger (2), who isolated the pathogen from fleas collected from wild rats.

The introduction of DDT, an insecticide with prolonged residual toxicity, into typhus control programs in 1945 and of anticoagulant rat poison in 1947 provided the tools with which the control of murine typhus was finally accomplished (fig. 1).

Incidence of the disease always has been greatest in the southeastern section of the country (fig. 2). Reported cases from 10 of the southeastern States rose from 1,799 in 1940 to 5,292 in 1944. Studies by Hill and co-workers

(3,4) indicated that probably at least two-thirds of the cases were not reported at that time, although by 1953 Quinby and Schubert (5) indicated that the trend may have been reversed, and the disease was being over-reported.

In Georgia, the number of reported cases of murine typhus rose from 57 in 1929 to 1,092 in 1937. Incidence of the disease was particularly high in the southern part of the State. By 1937 the disease had reached such proportions that a control program was initiated by the Georgia Department of Public Health (6). This program entailed elimination of harborage and food for rats and extermination of rats by trapping, poisoning, and rat-proofing of buildings. While these early programs were effective in localized areas, the total number of cases reported in the State rose to 1,135 in 1939, and 1,111 cases were reported in 1945 (fig. 3).

Bowdoin and Boston (7) stated that from 1932 to 1939 the greatest problems in the control of murine typhus in Georgia occurred in towns and villages and were associated chiefly with the business areas, particularly grocery stores, feed stores, and meat markets. However, beginning in 1945, shortly after Davis (8) demonstrated that DDT would control rat fleas, control programs using this compound so successfully disposed of these problems that by 1948 nearly 80 percent of 142 cases investigated in Georgia occurred in rural areas (9).

With the advent of DDT dusting, it was foreseen that the precise effect could be meas-

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# Signs

and

# Symptoms

## *of trends in public health*

A project aimed at promoting "more, and less frantic, speech making" was put into effect recently in Iowa. Under a new plan of the State Department of Social Welfare, materials prepared by staff for community interpretation will be swapped between State and county offices on a continuing "circuit" basis. Members of the department who are willing to share public interpretation materials which they have prepared are asked to send them in to the State office for mimeographing and distribution to county departments. The material so disseminated may be used in developing new talks or articles or verbatim, if it fits the occasion and time is pressing.

" "

Recent acquisitions of literature in the Chinese language at the National Library of Medicine include: photolithographs of ancient medical classics; herbals and collections of prescriptions and formulae for medicinal herb preparations still in common use; works, both ancient and modern, on acupuncture and moxibustion; popular handbooks and guides to basic health rules and practices in hygiene; and monographs on Western medical and pharmaceutical practice.

The relatively high proportion of material in the first and third categories reflects Peking's policy of "rectification of the erroneous attitude of slighting traditional medicine" and strengthening "the unity of traditional and Western style doctors . . . [to] . . . set in motion joint efforts in studying and systematizing traditional medicine" (*Chinese Medical Journal*, 79: 213,

1959). Works written as early as the Han Dynasty (206 B.C. to 220 A.D.) have been reproduced intact in some instances, and in others they have been re-edited, annotated, translated into colloquial language, or clarified through commentaries. The large amount of material on medicinal herbs reflects the intensive effort to domesticate wild herbs for large-scale cultivation to meet current requirements.

Monographs dealing with Western medical practice, aside from translations of English, Russian, and Japanese works, are predominantly basic, clinical discussions of infectious and communicable diseases. Little has been received concerning cancer, heart disease, poliomyelitis, or psychiatric disorders.

" "

About 87 million Americans have had at least one shot of polio vaccine and 68 million have had three or more injections, according to December estimates by the Public Health Service.

Among persons under 40 years of age, more than 34 million, or almost 30 percent, have had no vaccine. Among children under 5 years of age, the group that accounted for 43 percent of the paralytic cases this year, 4.5 million have had no vaccine.

" "

Connecticut has amended its public laws to permit special educational training or privileges to emotionally handicapped children (Public Act 664). Previously, this special treatment was confined to children between 4 and 21 years of age with a diagnosed physical or mental handicap.

At the 1960 annual meeting of the Health Physics Society in Boston, Secretary of Health, Education, and Welfare Arthur S. Flemming will speak on the responsibilities and activities of the Federal Radiation Council at a dinner session June 30. The 3-day session, beginning June 29, will also include a symposium on the effects of recommendations of the National Committee on Radiation Protection and Measurements on the interests and activities of labor, law, medicine, and insurance.

" "

In 91 hospitals in New York City with approved training programs during 1959, 48 percent of the interns and residents were graduates of foreign medical schools. One-fourth of the 9,254 interns and residents in 821 American hospitals were in New York. In 11 of New York's municipal hospitals, not one intern or resident was a graduate of an American school.

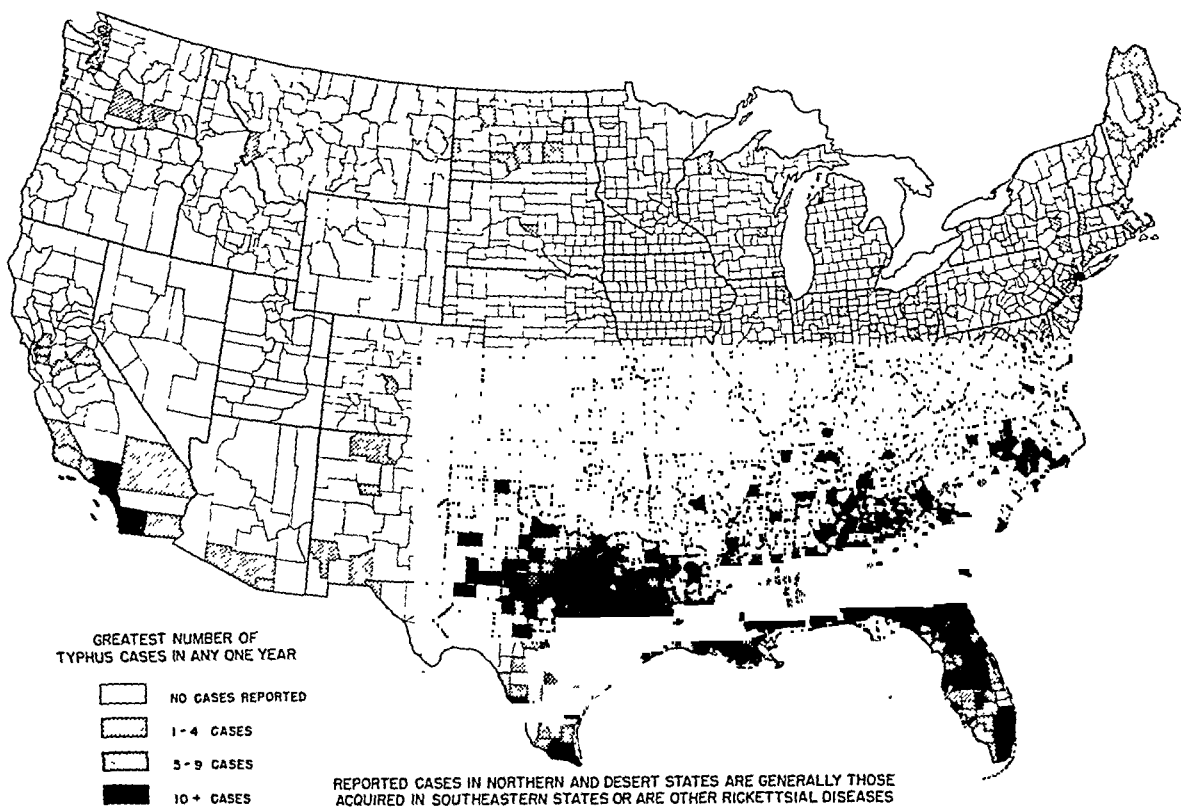
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Age and alcohol were significant factors in pedestrian fatalities in New York City in 1959. A study of 50 persons killed by automobiles while walking in Manhattan showed the average age of the victims was 59, one-half were born outside the United States and unmarried, and about three-fourths of those who died within 6 hours after an accident had been drinking. These and other findings of the study conducted by the driver research center of the New York State Department of Health in cooperation with other sponsoring groups were presented at the New England sectional meeting of the American College of Surgeons.

" "

Forty persons have been hospitalized in Chicago, Ill., for treatment of lead vapor inhalation; all but three were children. After two of the children died, the Chicago Board of Health ordered a wholesale drive against use of discarded storage batteries as fuel in space heaters and furnaces. Police reported four piles of discarded batteries had been found in vacant lots in the southside residential area of the city, where the victims lived.

Figure 2. Reported cases of endemic typhus in the United States, 1941-47



*norvegicus* prior to dusting was not measured, since relatively few rats in this species occurred in these counties at that time. However, in Thomas County incidence in this species was reduced from 28 percent in May 1946 to 6 percent in April 1948. In Grady County, incidence in these rodents ranged between 37 and 38 percent throughout this period.

This first study showed that good control was obtained for the oriental rat flea, *Xenopsylla cheopis* (table 1), and the mouse flea, *Leptopsylla segnis*. Control of the sticktight flea, *Echidnophaga gallinacea*, was erratic and little or no control of rat mites and lice could be noted. The study demonstrated decisively that murine typhus fever could be controlled with DDT.

The duration of control was studied between 1948 and 1950 (10, 11). Morbidity rates for human murine typhus continued to drop in the treated areas through 1950. In Thomas County, 69 cases occurred in 1945 in a population of approximately 34,000 people. This figure was

reduced to seven cases in 1947 and to two cases in 1949. Human murine typhus was not found in Thomas County through September 1950. In 1945, Brooks County had 35 cases in a population of approximately 16,000. In 1947 there were no cases, but two cases occurred in each of the years 1948, 1949, and 1950. Grady County, with nearly 17,000 population, experienced 46 cases in 1945, 28 cases in 1949, and 19 cases during the first 9 months of 1950.

Commensal rats collected during July and August of each year between 1948 and 1950 showed a constant infection rate of approximately 40 percent in Grady County. In Brooks and Thomas Counties, a consistent rate of approximately 10 percent was indicated. During this same period, the number of rats infested with the principal vector, *X. cheopis*, remained constant in Grady County at approximately 60 percent. In the dusted areas, infestation rates rose from an average low of about 4 percent in 1947 to about 30 percent in 1950.

Thus, during the 3 years following the typhus

ured accurately only by investigating the numerous factors which affect transmission of murine typhus. Accordingly, the Communicable Disease Center of the Public Health Service initiated studies on the control of the disease in support of State programs. The studies, conducted in several counties of southwestern Georgia, extended over a 12-year period from 1945 to 1957.

This report summarizes the information obtained from the investigations, compares the results from the various studies, and records conclusions concerning the control and possible eradication of murine typhus fever.

### Typhus Control Program

The area selected for studying the effectiveness of DDT dusting comprised portions of Brooks, Decatur, Thomas, and Grady Counties in southwestern Georgia (fig. 4). Decatur County operations were discontinued before completion of the project. In Brooks and Thomas Counties, the control program was confined to DDT dusting of domestic rat runways, burrows, and other rat habitats. Grady County was used as an untreated check area. Control operations, consisting chiefly of five

applications of 10 percent DDT dust, extended from April 1, 1946, through September 30, 1947 (4).

The incidence rates per 100,000 population for human murine typhus, during the 18 months before dusting operations began, were 174 for Brooks County, 180 for Thomas County, and 232 for Grady County. During the first 18 months of the operational program, these rates were reduced to 14.7 for Brooks County and 31.5 for Thomas County, but remained rather constant at 236 in untreated Grady County (4). Data on annual incidence is given in table 1.

A similar reduction of the disease in commensal rats was shown by complement fixation tests on serums from domestic rats collected throughout the study (table 1). Tests on small samples of *Rattus rattus* collected prior to April 1946 revealed infection rates of 50, 63, and 46 percent in rats collected in Brooks, Thomas, and Grady Counties, respectively. Collections of this same species between May 1947 and April 1948 gave positive results on 3.4 percent of specimens from Brooks County, 7.4 percent from Thomas County, and 35 percent from untreated Grady County (table 1).

The incidence of murine typhus in *Rattus*

Figure 1. Annual total of reported murine typhus fever cases in the United States, 1932-57

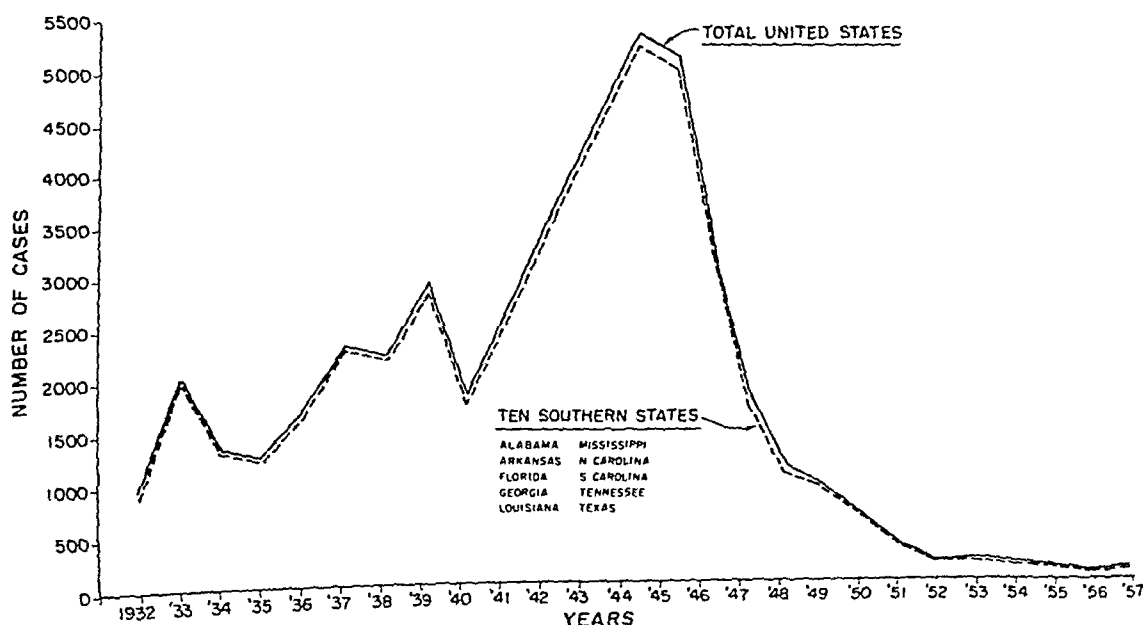
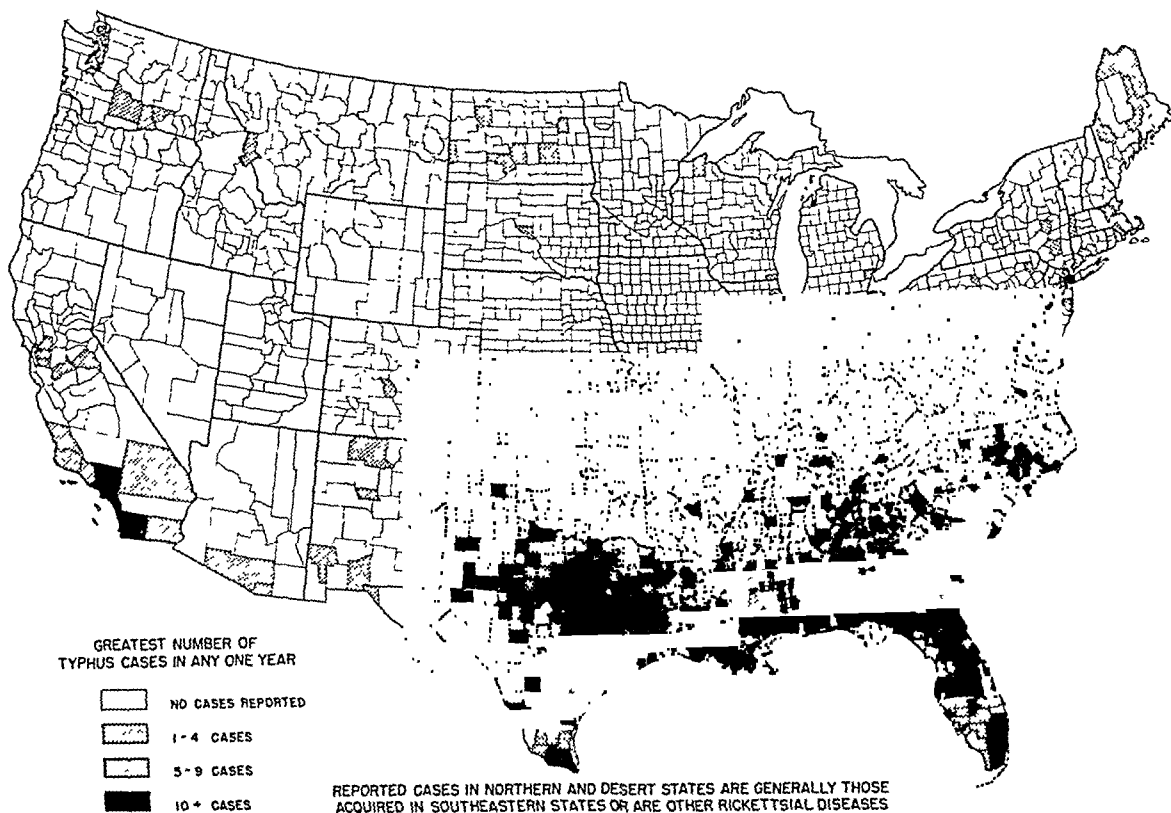


Figure 2. Reported cases of endemic typhus in the United States, 1941-47



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Thus, during the 3 years following the typhus



control operations, human incidence continued to drop, incidence in rats remained constant, and populations of the chief vectors increased.

### Ecological Studies

The reduction of murine typhus in commensal rats as a result of the DDT dusting program led to speculation concerning the eradication of the disease through a concerted effort to eliminate both the vector flea by dusting and the rodent hosts by use of the newly developed anticoagulant poisons.

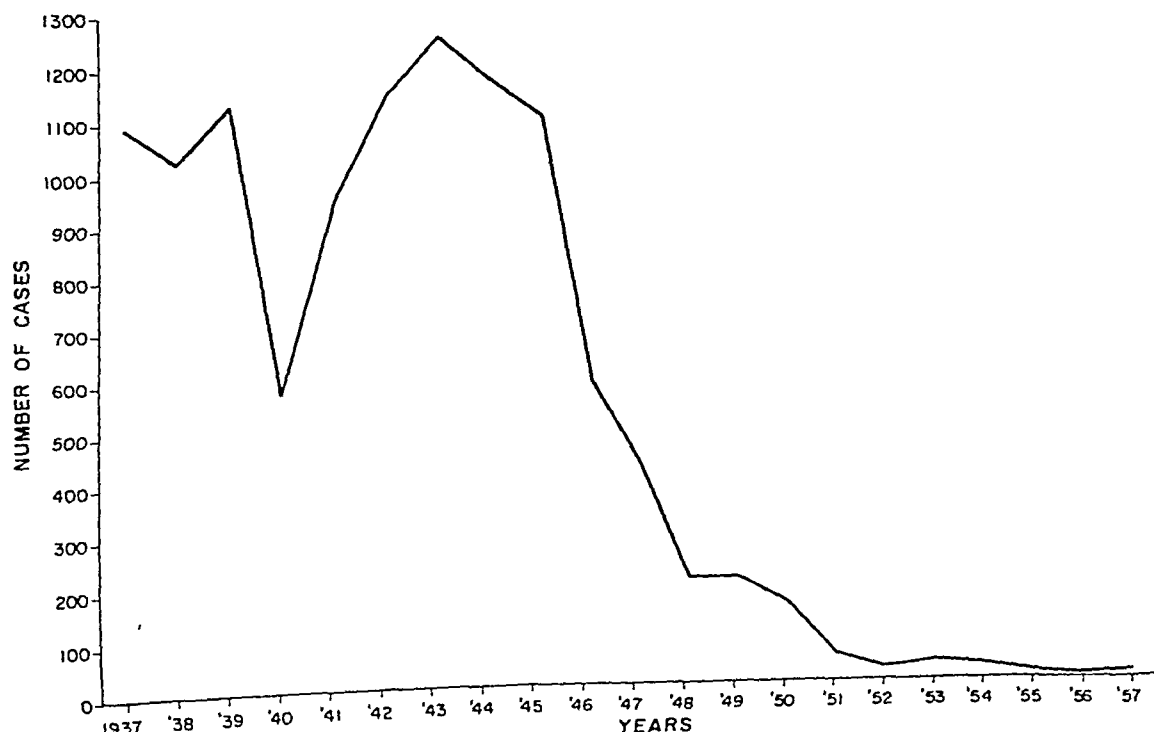
However, before appropriate techniques could be developed, it was necessary to gain thorough knowledge of the ecology of each group of organisms participating in the cycle of murine typhus transmission. Involved in the cycle are the pathogenic *Rickettsia*, the commensal rat reservoir, the possible reservoirs in other animal species, the ectoparasites which transmit the infection, and the susceptible hosts, either man or rodent, to which the infections are transmitted. Considerable

information concerning the ecology of these organisms was obtained during the course of the studies in southwestern Georgia.

### Commensal Rats

In a study of the bionomics of roof rats Ecke (12) demonstrated a decreasing roof rat population from 1946 to 1951. The decrease was attributed to an increased mortality of young rats between the stages of parturition and trappable age. A survival period of 6 months or less for the majority of roof rats of trappable age was indicated by disappearance of 80 percent of marked rats within that time. Males disappeared more rapidly than females. Fewer than 1 percent were found to roam a distance greater than 500 yards, and movements between buildings more than 100 yards apart were rare. It was suggested that movements of greater distances resulted from mechanical transportation. Roof rats on premises that also harbored Norway rats had a greater tendency to move than those on premises where there were no Norway rats. Field evidence indicated that

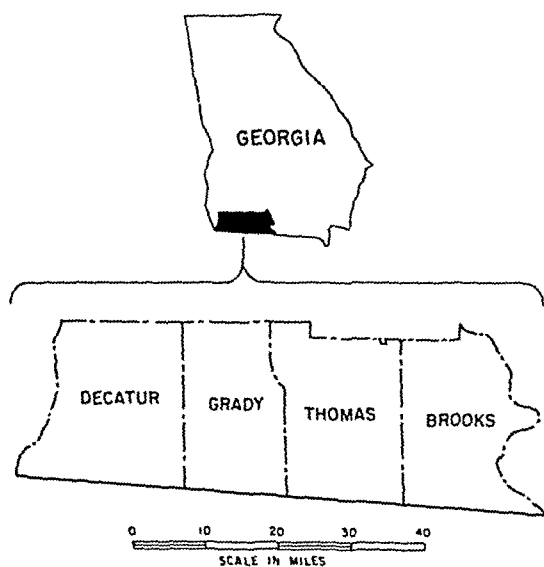
Figure 3. Annual total of reported murine typhus fever cases in Georgia, 1937-57



very few, if any, feral roof rats occur in southwestern Georgia.

The decline in commensal rat populations continued through 1956 (13). The incidence of infestations on farms in Thomas County dropped from 94 percent in 1946 to 35 percent in 1956. Studies indicated that although many ecological factors contributed to the decline, a series of drought years from 1949 through 1956 was apparently the most important factor. The scarcity of normal winter and spring rat foods, chiefly corn and peanuts, is believed to have affected the rat population adversely.

Figure 4. Location of typhus investigations in southwestern Georgia



In the three counties in which the typhus studies were being conducted, Ecker observed that between 1946 and 1951 Norway rats were constantly extending their range from north to south, invading roof rat territory (14). In 6 years the Norway rats over-ran about 1,000 square miles (fig. 5). The more aggressive Norway rats were able to exclude the roof rats from most of the infiltrated territory.

Melanism in the rat population of southwestern Georgia was reported by Smith (15). One hundred (19.1 percent) of the 523 Norway rats trapped alive in four counties of southwestern Georgia were black mutants. The high percentage of melanism indicates the probable inheritance of this character as a simple Mendelian

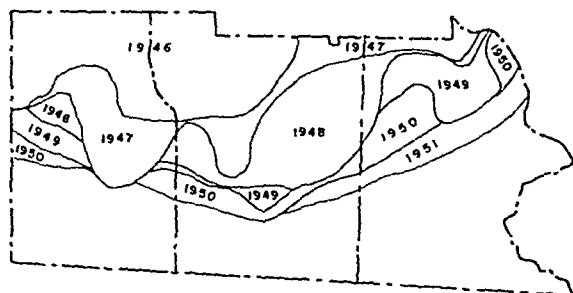
recessive. Black mutants were more prevalent southward of the advancing front of the invasion of Norway rats than elsewhere in the area. The mutants, it is believed, were chased out of the more stable colonies of normal Norway rats into roof rat territory where competition is less. Keeler (16) found that the black rats were much less aggressive than the Norways of normal color. There was no significant difference in the incidence of melanism in the sexes of the Norway rats trapped (18 percent of males black, 20 percent of females). No difference in the prevalence of typhus antibodies was noted between the normal Norways and the black ones (7.3 percent and 7.0 percent, respectively).

The effect of DDT dusting on commensal rats was studied by Dent and associates (17). They showed that the distribution of 10 percent DDT dust in rat habitats resulted in pathological changes consistent with DDT poisoning

Table 1. Results of murine typhus control program in Brooks, Thomas, and Grady Counties in southwestern Georgia

Period	Brooks	Thomas	Grady
Incidence of human murine typhus per 100,000 population			
1945.....	218	202	274
1946.....	72.8	97	290
1947.....	0	19.2	162
1948.....	10.5	8.5	141
1949.....	10.5	5.7	151
Percent of <i>R. rattus</i> positive to complement fixation test			
April 1946.....	50	63	46
May 1946-April 1947.....	25	42	41
May 1947-April 1948.....	3.4	7.4	35
July and August 1948.....	.5	8.0	37
July and August 1949.....	4.5	10	40
July and August 1950.....	9.5	9.5	45
Percent of <i>R. rattus</i> infested with <i>X. cheopis</i>			
April 1946.....	20	40	45
May 1946-April 1947.....	13	30	60
May 1947-April 1948.....	1.8	5.6	41
July and August 1948.....	3.5	19	58
July and August 1949.....	17	26	66
July and August 1950.....	25	31	74

Figure 5. Roof rat territory over-run by Norway rats, 1946-51



and in the accumulation of appreciable quantities of DDT and DDA in the livers and fat of exposed rats. In a treated colony of rats, 32.7 percent died within 7 weeks and 36.3 percent within 11 weeks, apparently from DDT poisoning. However, field observations indicated that such rates are in excess of those to be expected under natural conditions where rats can exercise greater freedom in avoiding unfavorable situations.

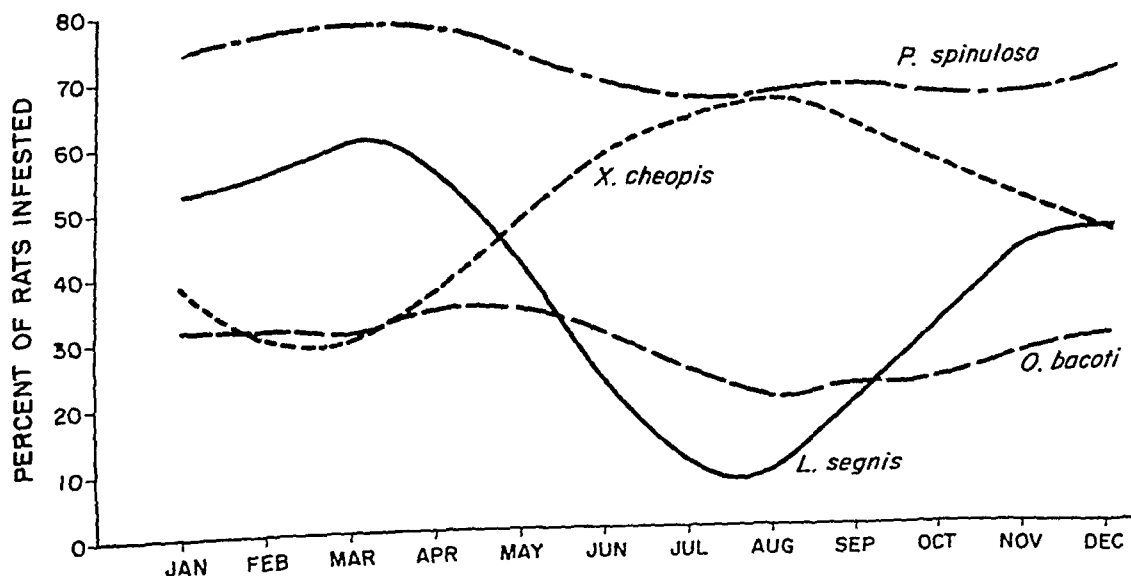
In a study of the ecology of commensal rats in relation to murine typhus, Morlan and associates (18a) observed that rats abandoned well-established, dusted runways in favor of new, undusted ones. They also suggested that fluctuations in rat populations on rural premises were more affected by the amount of food

available than by changes in climatic conditions. From a study of captive colonies of rats, they concluded that odor trails of established runways may be an important guide to rats. Measurement of more than 3,500 specimens determined the average body length of immature roof rats to be 124.3 mm. and for adults 165.9 mm. Average body lengths of Norway rats were 140.5 mm. for young and 206.3 mm. for adults. Reproductive activity for both species of rats centered around one peak in March and a lesser peak in August. In both species reproductive capacity was proportional to body length. The average titer level of positive serums from Norway rats was considerably higher than that for serums from roof rats, but there was no consistent difference in prevalence of typhus antibodies in the two species.

### Ectoparasites

The ectoparasites of commensal rats in relation to murine typhus were studied by Morlan and associates (18b). Between May 1946 and April 1949, more than 20,000 rats were trapped and examined for ectoparasites. *X. cheopis*, *L. segnis*, *Ornithonyssus* (*Bdellonyssus*) *bacoti*, and *Polyplax spinulosa* accounted for nearly 95 percent of the ectoparasites recovered. *P. spin-*

Figure 6. Seasonal abundance of the common ectoparasites of commensal rats as indicated by percent of rats infested (3-month moving average)



*ulosa* consistently infested a higher percentage of each species of rat than did any other ectoparasite. Rats which were positive to murine typhus complement fixation tests were more frequently infested with *X. cheopis* and *L. segnis* than negative rats. *X. cheopis* and *O. bacoti* infested young rats more frequently than adult rats. In an area without a murine typhus control program, *X. cheopis*-infested rats were found on between 80 and 90 percent of the premises from which rats were collected. Female *X. cheopis* and *L. segnis* predominated in samples of fleas taken. The proportions of female *X. cheopis* tended to increase in months with lower mean temperatures (60°-70° F.) and to decrease in months with higher mean temperatures (80°-90° F.). The seasonal prevalence of the most common ectoparasites of commensal rats is shown in figure 6.

Morlan (19) investigated the possibilities of adding either hydroxy-pentamethyl flavan or sulfur to DDT formulations in an effort to control effectively the tropical rat mite, *O. bacoti*, and the spined rat louse, *P. spinulosa*. Neither of these species was greatly affected by DDT dusting, but each of them transmitted murine typhus experimentally among laboratory animals (20,21).

A mixture of 8 percent DDT and 10 percent sulfur gave only slightly better control of the mite than DDT dust alone, and no appreciable reduction of the mite resulted from a mixture containing 8 percent DDT and 10 percent flavan. Neither of the mixtures significantly affected the spined rat louse.

Host relationships of arthropod ectoparasites were reported by Morlan (22). More than 506,000 ectoparasites were obtained from 32,320 mammals collected between October 1945 and April 1949. Twenty-eight host species yielded 7 species of *Mallophaga*, 7 species of *Anoplura*, 1 of *Hemiptera*, 3 of *Coleptera*, 5 of *Diptera*, 16 of *Siphonaptera*, and 66 species of *Acarina*. Small numbers of three additional host species were examined, but they were not infested. Forty-nine species of arthropods were collected from roof rats, 41 from Norway rats, 30 from cotton rats, 27 from opossums, 17 each from cottontail rabbits, gray squirrels, Florida skunks, and spotted skunks, 16 from cotton mice, 15 each from old-field mice, house mice,

and raccoons, 12 from foxes, and 11 each from little brown bats, fox squirrels, and domestic cats. The remaining 12 host species were parasitized by 10 or fewer species of arthropods. The seasonal abundance of several species of cotton rat ectoparasites is also reported.

### Epidemiology

A review by Stewart and Hines (23) of 452 cases of murine typhus occurring in southwestern Georgia from January 1945 to January 1953 showed a seasonal peak of rural cases during the summer but an even distribution of urban cases throughout the year. Incidence rates were about twice as high in rural as in urban areas and about eight times greater in the white persons than in Negroes. Age-specific incidence rates were low in children, rising to a peak during the fourth and fifth decades. The mean titer of the Weil-Felix test was high during the first week of a murine typhus illness and then rapidly declined, whereas the mean titer of the complement fixation test reached a peak during the second week and remained high over the next 50-60 weeks, after which it slowly declined. When patients were treated with aureomycin, there was a consistent lowering of the mean titers for the complement fixation test, but very little effect on the Weil-Felix titers was demonstrated.

### Eradication Program

In July 1953, efforts were begun to eradicate murine typhus from the southeastern quarter of Grady County, an area of approximately 130 square miles. Dusting of rat runs plus the distribution of maintenance of rat poisons (fig. 7) at all premises infested with rats continued through May 1954 (24). Commensal rats were eliminated successfully from 309 (88 percent) of 349 rural premises during the 9-month eradication period.

	Number of premises
Total premises inspected.....	713
Infested and treated.....	349
Infested and treatment refused.....	3
Not infested.....	361
Cleared of rats.....	309
Eradication incomplete.....	40



Figure 7. Distribution of rat poison during murine typhus eradication program in southwestern Georgia

Twenty-five percent of these cleared premises became reinfested within 1 year (table 2), and about 30 percent were, or had been, reinfested at the end of 2 years. The third year's inspection revealed that 40 percent of the cleared premises had been reinfested at some time.

At the end of the operational phase of the eradication program, *X. cheopis* fleas were found on 9 percent of 70 rats collected at the 40 premises where rat eradication was not successful. Three months later, no *X. cheopis* was found on 34 rats collected at 16 premises where rats had been eliminated but where reinfestation had occurred. One year later, examinations of 162 animals collected from all farms (61) in the eradication area where trapping appeared to be productive disclosed no *X. cheopis*.

At the end of 2 years, 142 rats were trapped from 42 premises where recent rat signs existed. Twelve rats (8.5 percent) had *X. cheopis* infestations. After 3 years 4.1 percent of 148 rats collected were infested with *X. cheopis*.

Positive complement fixation tests were obtained on 3 of 70 rats collected at the end of the operational phase of the eradication program from premises where rats were not eradicated. This indicated an incidence of slightly more than 4 percent in an area where murine typhus incidence in rats had averaged above 40 percent during the previous 9 years. Three of 34 rats collected from cleared but reinfested premises 3 months after eradication gave positive complement fixation tests. However, since these were adult rats it is believed they became in-

**Table 2. Commensal rat infestations at farms 1, 2, and 3 years after the end of experimental typhus eradication measures in Grady County, Ga.**

Infestation status	Number of years after treatment		
	1 (1955)	2 (1956)	3 (1957)
Number of premises inspected---	532	532	493
Percent of premises cleared of rats by May 1954:			
Remained uninfested-----	70.6	67.0	58.3
Infested at time of annual inspection-----	25.4	17.2	29.9
Became infested, but clear at time of annual inspection-----	4.0	15.8	11.8
Percent of premises uninfested during operational programs:			
Remained infested-----	91.5	89.4	85.5
Infested at time of annual inspection-----	6.7	3.5	6.7
Became infested, but clear at time of inspection---	1.8	7.1	7.8
Percent of premises not cleared of rats by May 1954:			
Remained infested-----	44.8	24.1	21.4
Uninfested at time of annual inspection-----	55.2	72.4	46.4
Became uninfested, but re-infested at time of annual inspection-----	.0	3.5	32.2

fed before the eradication program was completed.

Of 124 rats collected from 78 premises 1 year after eradication only 1 rat gave a positive complement fixation test. This rat was taken at the extreme periphery of the area and probably had migrated from an untreated area. Tests on serums from 138 rats collected 2 years after eradication measures ceased indicated previous typhus infections in 4 rats (2.9 percent) collected from 2 farms. One farm was on the border of the eradication area, while the other was well within. Neither had previously harbored typhus-infected rats. Three years after eradication, complement fixation tests of serums from 148 rats trapped at 66 premises were negative.

#### Effectiveness of Control and Eradication

Results of the DDT dusting program and the eradication program are not directly compa-

table for many reasons. The studies were not conducted concurrently, and environmental factors which affect rodent and ectoparasite populations were not consistent throughout the periods covered by the two studies. Both programs were highly effective, and the advantages of one over the other are speculative. In the dusting program, maximum effectiveness appears to have been obtained in approximately 1 year during which four dusting cycles were completed. Each cycle required about 3 months to complete, but because of the residual effectiveness of DDT it is doubtful that more frequent dusting would have produced better results. The operational aspects of the eradication program were completed in 9 months, but because of the climatic variations this difference of 3 months cannot be considered significant. It is probable, however, that a larger working force may have completed the eradication program in a shorter time. Since rat runs were dusted on both programs, the choice between the two must be made on the basis of the advantages of removing rats. At first glance, and certainly for immediate control, rat poisoning would appear desirable.

A program which produces such obvious effects as the removal of rats is readily accepted, although this acceptance usually takes the form of verbal encouragement rather than assistance. The majority of property owners cooperated to the extent of letting their premises be treated.

The poisoning of rats increases the activity of their ectoparasites and consequently increases the percentage which would contact a well-distributed residual insecticide. Also the reduction or elimination of rats provides far less opportunity for the multiplication of the small residuum of ectoparasites. However, from the viewpoint of controlling arthropod-borne diseases, the increased ectoparasite activity which accompanies rat poisoning may also increase the possibility that people will be bitten by infected specimens.

The dusting program effectively held ectoparasite populations at a low level for approximately 1 year after operations had stopped (table 3). Dusting once a year at the optimum time may maintain the ectoparasite populations at a low level in a rather stable commensal rat population. When both rats and ectoparasites

Table 3. Comparison of results of control and eradication programs

Program status	Dusting program		Eradication program	
	Percent of rats positive to complement fixation test	Percent of rats infested with <i>X. cheopis</i>	Percent of rats positive to complement fixation test	Percent of rats infested with <i>X. cheopis</i>
Preoperations survey.....	50.0	40.0	40.0	65.0
Operations suspended.....	4.0	12.5	4.3	9.0
1 year postoperations.....	4.0	4.0	.8	.0
2 years postoperations.....	7.0	20.0	2.9	8.5
3 years postoperations.....	10.0	30.0	.0	4.1

are removed, unless constant surveillance is maintained, premises become reinfested with rats which reintroduce ectoparasites from beyond the periphery of the control area.

In the typhus eradication area of Grady County, premises freed of rats became reinfested at the rate of 25 percent during the first year, 30 percent in 2 years, and 40 percent in 3 years. These data indicate that commensal rat populations probably return to former levels at a slower rate than would the ectoparasite populations when rats are not removed. Neither the dusting program nor the eradication program completely eliminated vectors or reservoirs of murine typhus. Subsequent to the dusting program serologically positive rats were reduced to 4 percent of the population. But as a result of the eradication program, the amount of typhus in the rodent reservoir, and therefore the source of infection for vector fleas, was reduced to a point where it was not detected.

Comparative costs of the two programs are again a matter of speculation. A thorough rat poisoning and dusting operation would require at least twice the time needed to complete one dusting cycle. Since labor is the major expenditure of such programs, the final expense could be twice that of the dusting program. This assumes, of course, that a single dusting cycle would successfully control the ectoparasites, a premise which is not indicated by the evidence. If two or more dusting cycles were found necessary, the costs of the programs should amount to approximately the same figure. The savings to residents of control areas resulting from the rat poisoning program may not be a considera-

tion in evaluating the effectiveness of disease control programs. But it appears that should two equally effective methods be available, the method of choice should be the one which yields the greatest overall benefit. The eradication-type program has three distinct advantages over the dusting program: greater reduction in the source of human infections with murine typhus, better acceptance by the public, and additional savings which result from the elimination of rats.

A third method of murine typhus control which has received some consideration is the elimination of rats by poisoning alone and omitting the DDT dusting to control ectoparasites. Such a program has exactly the same public appeal as the eradication programs, but has some serious deficiencies. Complete rat elimination was never accomplished in the experimental eradication area, and it is highly improbable that it can be achieved over sizable areas. In addition, infected vectors parasitic on the rats poisoned could remain in the area and constitute a hazard to man for many months. The additional expense involved in dusting rat runs concurrently with the poisoning operations is so small that its omission seems impractical.

#### Incidence in Other Feral Animals

The cotton rat, *Sigmodon hispidus*, appears to be the feral rodent most likely to establish itself in farm buildings where commensal rats have been eliminated. Its importance as a possible natural reservoir of typhus and the questionable ability of its chief ectoparasites to transmit the disease justified investigation (25).

Five hundred and twenty-nine cotton rats were trapped at monthly intervals from several locations in four southwestern Georgia counties from March 1956 to March 1957. Their blood serums were tested for murine typhus antibodies by complement fixation tests, and their ectoparasites were removed and identified. Only 1 cotton rat had a titer indicating previous typhus infection (1:128), while 15 other specimens exhibited lower titers. The most numerous ectoparasites were the cotton rat louse, *Hoplopleura hirsuta* Ferris, the mite, *Haemolaelaps glasgowi* (Ewing), and the cotton rat flea, *Polygenis (Rhopalopsyllus) gwyni* C. Fox. The peaks of abundance for the cotton rat louse, *H. hirsuta*, and the mite, *H. glasgowi*, coincided and occurred during late winter and early spring. The peaks of abundance for the flea, *P. gwyni*, were in February, April, and June. Based upon a comparison with earlier collections made in 1947-48 by Morlan and co-workers, an extraordinarily warm February in 1957 advanced the time of peak abundance in the case of each of the most numerous ectoparasites. The 5 species of fleas collected totaled 729 specimens; 11 species of mites, 7,108 specimens; 2 species of ticks, 10 specimens; and 2 species of lice, 6,360 specimens. Altogether 14,207 ectoparasites were collected, or 29 ectoparasites per infested cotton rat. Ninety-three percent (488) of the 523 rats had some ectoparasites. Higher percentages of cotton rats were infested by cotton rat fleas and *H. glasgowi* during a year with above-normal rainfall (1947-48) than in a dry year (1956-57), while the opposite was true for the louse, *H. hirsuta*.

The present importance of the cotton rat and its ectoparasites in the epidemiology of rural murine typhus is minor, but certain ecological and economic factors which favor possible increases may change the present situation.

Murine typhus in animals other than commensal rats was studied by Morlan and associates (26). Serums from 3,202 animals representing 37 species were tested by complement fixation, and 47 from 12 species were positive. Positive serums were obtained from the opossum, cottontail rabbit, fox squirrel, house mouse, rice rat, cotton mouse, old-field mouse, cotton rat, dog, Florida skunk, weasel, and blue jay. Samples greater than 100 specimens were obtained on

opossum, cottontail rabbit, house mouse, cotton mouse, old-field mouse, cotton rat, and Florida skunk. The percent of positive serums from these species varied from 0.5 for the cottontail rabbit to 2.7 for the cotton rat. Sufficient serum samples from gray squirrels, raccoons, domestic cats, and common hens were tested to indicate that these species are rarely, if ever, infected.

### Summary and Conclusions

From 1945 to 1957 investigations of murine typhus were conducted in a four-county area of southwestern Georgia. During this period efforts were made to control the disease with DDT applied to rat runs and to eradicate the disease from a rural area by using both DDT applications and the anticoagulant rat poisons. In addition, a wide range of information was obtained on the ecology and vector-host relationships of ectoparasites and commensal rats and other mammals.

The investigations sought to determine the effectiveness of various methods used to control murine typhus, especially in rural areas. Although this purpose was fulfilled in considerable detail, the results obtained from the studies are significant from other aspects. First, it was shown that some commensal rat ectoparasites (*Xenopsylla cheopis* and *Leptopsylla segnis*) can be controlled by DDT dusting, while others (*Ornithonyssus bacoti* and *Polyplox spinulosa*) cannot. This information should be applicable to the control of any disease organism for which commensal rodents serve as the reservoir, particularly plague. The effectiveness of the programs extended for a considerable period following cessation of operations, indicating that periodic short-term operations would probably maintain the control of these diseases indefinitely. Commensal rat populations in rural areas, it was shown, can be controlled very effectively at a reasonable cost. While the elimination of rats is usually considered a part of environmental sanitation and the responsibility of the individual occupants of premises, the effectiveness of rat control is directly proportional to the size of the area freed of these rodents. For this reason, it would probably be advantageous to undertake rat elimination programs on at least a county-wide basis.



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# Cortisone and ACTH Impairment of Response to Rabies Vaccine

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CORTISONE and corticotropin have been widely and successfully used in controlling human reactions to rabies vaccination, particularly the neuromuscular and anaphylactoid reactions induced by the rabbit brain tissue in the vaccine mixture. Although both drugs are used to control these reactions, this study may indicate that cortisone actually interferes with the production of immunity and thus defeats the objective of vaccination. ACTH, on the other hand, does not appear to significantly impair neutralizing antibody response to rabies vaccine, and would seem to be the drug of choice should the need for such treatment arise.

Interest in this problem was aroused when one worker in the Fourth U.S. Army Medical Laboratory was accidentally exposed while working with a rabid laboratory animal. He was given 11,000 units antirabies serum (refined and concentrated horse serum) and 0.5 milliliter modified Harris vaccine daily for 14 days. On the 7th day of the prophylactic regimen, urticarial and anaphylactoid reactions

(dyspnea) were observed and steroid treatment was instituted as follows: oral cortisone 300 milligrams daily from the 7th through the 14th days, with a gradual reduction in dosage and ultimate discontinuance of the drug on the 24th day (total dosage 4,200 mg.); intravenously administered hydrocortisone, 100 mg. on the 7th and again on the 9th day; Acthar Gel, 80 units per day from the 9th through the 16th days and 40 units per day from the 17th through the 25th days. By the 27th day, reaction symptoms were completely alleviated and the patient was discharged.

The patient (E.G.) exhibited a high level of circulating neutralizing antibody for a period of 21 days (table 1). The titer of neutralizing antibodies then fell rapidly, and even after 116 days, no evidence of active immunity, such as might have been expected from administration of Harris vaccine, was detectable. The time-titer relationship is compatible with passive immunity conferred by the prior administration of antirabies serum.

The normal response to rabies prophylactic treatment employing 14 daily doses of 0.5 ml. of rabies vaccine (modified Harris), administered subcutaneously was investigated by collecting serum specimens from five persons reporting to the emergency room, Brooke Army Hospital, with a history of exposure to the bites of rabid animals. Their serums were obtained at frequent intervals after initiation of prophylaxis (table 1). None of the individuals received antirabies serum at the time of treatment in the emergency room and none reported having received antirabies immunization at any

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*At the time of this study, the authors were working in the Fourth U.S. Army Medical Laboratory, Fort Sam Houston, Tex., where Lt. Colonel Lukeman was commanding officer and Mrs. Shelton remains as bacteriologist, Virology Division. Lt. Colonel Burns is assigned presently to the U.S. Army Chemical Warfare Laboratories, Directorate of Medical Research, Army Chemical Center, Md., and Major Grogan is now with the Walter Reed Army Institute of Research, Walter Reed Army Medical Center, Washington, D.C.*

prior date. Neither ACTH nor cortisone was administered to any of this group. All five individuals demonstrated positive log neutralization indices ranging from 3.8 to 4.2 (table 1) when serums collected 18 to 21 days following initiation of therapy were compared with serums obtained before vaccination.

These results are to be expected from active immunization and strongly imply that the failure of the vaccine to immunize the first patient mentioned (E.G.) may well have been due to the concomitant administration of steroids. To investigate this possibility, animal experiments were undertaken.

#### Experiments on Animals

Rabbits were selected for this experiment, because much is known of their immunophysiology (1-5), particularly the role of the adrenal glands in immune reactions (6). Mature male Flemish animals weighing 3 to 4 kilograms were obtained locally and were allowed a

2-week period of acclimatization prior to initiation of the experiment. Throughout the study they were permitted a standard diet of rabbit chow ad libitum. A 16-hour fast was imposed prior to collection of serum samples.

Rabies vaccine (modified Harris), packaged for human use with 14 individual 0.5 ml. doses per box, was used. The Harris type vaccine is a living, attenuated virus, prepared by suspending in sterile distilled water the brains of rabbits that have been infected with attenuated (fixed) rabies virus.

A saline suspension of cortisone acetate (11-dehydro-17-OH-corticosterone-21-acetate) and corticotropin, ACTH (adrenocorticotrophic hormone, lyophilized), 40 international units per vial, reconstituted with 1.0 ml. of physiological saline on the day of injection, were employed.

#### Method

Thirty rabbits were divided into five groups of six each (table 2). Therapy was admin-

Table 1. Serum neutralization studies on human subjects receiving rabies vaccine

Treatment	Patient designation	Days after start of immunization	Log LD <sub>50</sub>	Log neutralization index
Antirabies serum (horse) plus 14 daily doses rabies vaccine plus cortisone and ACTH.	E.G.-----	0	5.8	0.0
		10	2.3	3.5
		14	2.5	3.3
		17	3.0	2.8
		21	3.8	2.0
		24	5.1	.7
		30	5.5	.3
		59	5.7	.1
		81	5.8	.0
		116	5.7	.1
Rabies vaccine alone-----	S.W.-----	0	5.8	.0
		10	4.0	1.8
		21	2.0	3.8
	D.D.-----	0	6.2	.0
		10	3.7	2.5
		18	2.0	4.2
	J.P.-----	0	5.8	.0
		21	1.8	4.0
		53	1.7	4.1
	J.J.-----	0	5.8	.0
		15	2.8	3.0
		21	2.0	3.8
	O.D.-----	0	5.8	.0
		10	2.0	3.8
		20	2.0	3.8
Controls-----	D.V.M.-----	Positive	1.0	4.8
	J.D.-----	Negative	5.8	.0

istered to each group as follows: group 1, rabies vaccine; group 2, rabies vaccine and cortisone; group 3, rabies vaccine and ACTH; group 4, cortisone; and group 5, ACTH. Two additional rabbits, designated as group 6 received no injections.

Groups 1, 2, and 3 received 14 daily doses of 0.5 ml. of a 1:10 dilution of the rabies vaccine. Injections were made subcutaneously in the cervical and scapular area. In view of the fact that the usual 20 percent Harris vaccine is given to adult and child alike in the same amount (0.5 ml.) and for the same number of scheduled doses (14), this dilution for rabbits

is approximately proportional by weight to an appropriate dose for an 80-pound child.

Cortisone acetate was given in 14 daily doses of 5.0 mg. each by intramuscular injection in the gluteal region. This dose is comparable to that given therapeutically to a 165-pound man. ACTH (20 I.U.), representing 50 percent of the minimal dosage recommended for control of drug sensitivities in adults, was given in the same manner. The ACTH dosage employed, although not pharmacologically equal to the cortisone dosage, is in excess of the physiological dose recommended for the rabbit.

All animals were weighed and bled from the

**Table 2. Individual neutralization titers of rabbits receiving rabies vaccine (modified Harris) with and without simultaneous cortisone or ACTH**

Group	Rabbit No.	Log LD <sub>50</sub> of serum vs CVS rabies virus	Log neutralization index of serum vs CVS rabies virus			
		Collection days				
		0	15	30	53	
Group 1, rabies vaccine-----	1	5.4	1.8	2.4	2.3	
	2	5.7	3.5	2.9	3.1	
	3	5.4	1.5	3.2	3.0	
	4	5.1	3.1	3.6	3.5	
	5	5.7	2.1	3.2	2.0	
	6	5.4	2.8	3.9	3.8	
Group 2, rabies vaccine plus cortisone-----	7	5.2	.0	.0	.7	
	8	5.8	.4	.5	.5	
	10	5.0	.6	2.0	1.5	
	11	5.4	.0	.4	.0	
	12	5.3	.1	.0	.8	
Group 3, rabies vaccine plus ACTH-----	13	5.5	1.3	2.8	2.7	
	14	5.6	2.1	2.8	2.0	
	15	5.2	1.6	1.0	2.7	
	16	5.4	.2	2.1	1.5	
	18	5.5	1.9	3.1	2.9	
Group 4, cortisone-----	20	5.9	.1	.1	.0	
	21	6.2	.8	.9	.5	
	22	5.4	.0	.0	.0	
	23	5.7	.0	.0	.0	
	24	6.2	.1	.2	.7	
Group 5, ACTH-----	25	5.3	.0	.0	.0	
	27	5.4	.0	.0	.0	
	32	5.3	.1	.0	.0	
	35	5.6	.0	.0	.0	
Group 6, uninoculated-----	31	5.4	.0	.0	.0	
	34	5.5	.1	.0	.3	
Controls:						
Positive <sup>1</sup> -----		1.3	4.1			
Negative-----		5.4	.0			

<sup>1</sup> Lederle antirabies serum (rabbit) refined and concentrated.

heart prior to inoculation and 15, 30, and 53 days after initiation of therapy. Neutralization tests were conducted according to the method recommended by the Commission on Viral Infections, Armed Forces Epidemiological Board, as quoted from Paul (7), with the exception that the second hour of incubation of the serum-virus mixtures was accomplished at 4° C. The neutralizing capacity of each serum was expressed as the log neutralization index, or the difference in log LD<sub>50</sub> end points of a given serum-virus mixture as compared with the appropriate pre-inoculation serum.

A serum was regarded as positive if the log neutralization index was 1.7 or greater. Those less than 1.0 were reported as negative, and results between 1.0 and 1.7 were considered equivocal. Rabies Challenge Virus Standard (CVS) was employed as the test virus. The rabies-fixed virus was supplied by Lederle Laboratories. Known positive and negative serums were included with each test for control purposes.

### Results

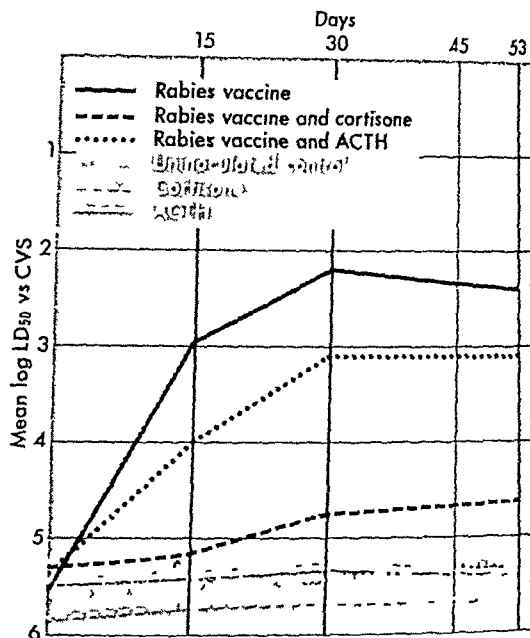
Twenty-seven of the 32 rabbits used in this study survived an observation period of 53 days, and were included for serum neutralization studies.

All six of the rabbits receiving rabies vaccine alone (group 1) exhibited positive log neutralization indices (table 2). Of the six that received rabies vaccine and cortisone (group 2), five survived; four showed no significant immunity at the end of the observation period as measured by the neutralization test, and one had an equivocal neutralization index.

In contrast to these negative findings when cortisone was administered concomitantly with rabies vaccine, four of the five surviving rabbits that received ACTH and rabies vaccine (group 3) yielded positive antibody responses, while one was equivocal.

All rabbits that received cortisone or ACTH alone, as well as those not inoculated, exhibited no change in their immunological status. Mean log LD<sub>50</sub> titers for each treatment group indicate the depressing effect of simultaneous administration of cortisone with rabies vaccine and the minimal interference by ACTH, at the dosage employed (see chart). The antibody

Mean log LD<sub>50</sub> compared with CVS titers of rabbits receiving rabies vaccine (modified Harris) with and without simultaneous cortisone or ACTH



response in the group which received vaccine alone and that given vaccine along with ACTH falls in the positive category of criteria set forth by the Commission on Viral Infections

### Discussion

Since steroid therapy is often indicated clinically to offset the various allergic and paralytic reactions rising from the administration of rabies vaccine, the question herein is of considerable practical importance. As indicated by observation of one human case and by animal experimentation, our results strongly imply that cortisone should be avoided when rabies vaccine is being administered, since it apparently interferes with the production of neutralizing antibodies.

The impairing effects of ACTH, on the other hand, appear relatively less harmful, at least in the doses employed in our experiments, and probably do not adversely affect developing immunity. According to our studies, ACTH does result in a somewhat lower titer of neutralizing antibodies than when vaccine alone is employed (group 3 compared with group 1), but four of five animals receiving this drug nevertheless de-

veloped sufficiently high antibody titers to fall into the positive category.

Kass and associates (8-10) were able to show that rabbits ordinarily produce corticosterone as the predominant secretion of the adrenal gland and, as ACTH is given, there is a progressive shift toward cortisol production by the adrenal. Thus, at varying dose levels of ACTH these authors were able to get different effects on the production of antibodies, correlating roughly with the expected production of cortisol. They were led, therefore, to postulate that corticosterone has less effect on resistance to infection and on antibody response than does cortisone.

Although direct extrapolation of the results from rabbits to man should not be made because of the alteration in endogenous steroid output after the use of exogenous steroids in rabbits (11), there is, nevertheless, a definite indication of the need for conservative use of cortisone in humans when administered simultaneously with rabies vaccine for control of allergic manifestations.

While cortisone and, to a certain extent, ACTH interfere with the immunizing properties of rabies vaccine, neither drug appears to affect passive immunity adversely. The persistence of rabies neutralizing antibody in circulation for as long as 21 days seems to indicate that neither ACTH nor cortisone therapy caused early destruction of the administered passive immunity.

There is no reason to believe that the suppression of formation of rabies-neutralizing antibodies by cortisone in these experiments was a specific or selective effect. Previous experiments in rabbits (12) have shown that such results represent a general depression of protein anabolism and hence of antibody formation. The present observations are probably explainable on the same basis.

### Summary

The concomitant administration of cortisone and ACTH to a patient who was receiving rabies vaccine appeared to prevent the production of active immunity.

Further studies on rabbits showed that cortisone interferes with the active immunity ordinarily resulting from rabies vaccine. ACTH,

on the other hand, while slightly depressing titers, does not prevent the formation of neutralizing antibodies.

It would appear, therefore, that for allergic reactions requiring steroid treatment arising during the course of administration of rabies vaccine, ACTH is the drug of choice and that cortisone is contraindicated.

In the single human case studied, neither drug affected adversely the passive immunity conferred by the injection of antirabies serum.

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# Research: Challenge to Health Departments

PAUL Q. PETERSON, M.D.

MANY health workers have expressed concern over the disparity between the emphasis placed on medical research and application of the results of research in program activity. The reasons for this concern are easily understandable, and it should be made a matter of record that research administrators are also concerned with problems of dissemination of information and application of knowledge. Concern over a problem may be a good thing because it implies analysis, and understanding may result from the thinking that takes place during the process.

In any discussion of an issue, the principle involved should be clearly stated. Therefore, let me state that I think the evidence is quite clear that the health department's primary mission of service is accomplished best if it is based upon a firm foundation of basic research that has been applied to programs through carefully conceived developmental research. This being the case, it appears to me that the health department has a twofold role in research: one is primarily in epidemiological investigations, the other is in operational studies.

The health department's primary mission of service must not be jeopardized by any tangential activity, no matter how attractive. However, I would suggest that the professional stimulation that comes from participation in a

research endeavor will, in most instances, more than compensate for the time given to the research project. This is such a well-established principle in academic institutions that faculty time is programed to include research.

Another very significant aspect of this subject is the nature of research itself. According to the one definition, research is a "studious inquiry having for its aim the discovery of new facts and their correct interpretation." This, therefore, includes orderly observation of occurrences, the accurate recording of data, and the objective analysis of the information compiled. Every day in every health department with a program worth its salt, observations are being made routinely. However, most recording of these observations is designed to furnish administrative rather than scientific information. Only a few departments make a serious effort to analyze the data in their records, so much valuable information is lost in the files.

Yet public health is the specialty that created and refined epidemiology as a technique, a procedure, and a thought process. The one health organization in the best possible position to make professional observations on groups of people is the health department. Because some of the answers to the most pressing public health problems hinge on studies of the natural history of disease, the inevitable conclusion is that health departments have a vital contribution to make through research. Perhaps I should say investment rather than contribution, because research pays dividends.

Whether the disease be infectious or non-infectious, whether it be acute or chronic in

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nature, longitudinal epidemiological studies represent the only presently known way in which a substantial part of the knowledge we must command can be marshaled adequately. The equation, as I see it, may be stated as follows: Medicine needs information that can come only from careful studies of the natural history of disease. The epidemiological method is the research system of choice. The health department, by tradition, training, position, and skill, should be better able to do this type of research than any other professional group.

I know that I am suggesting new responsibilities, but health departments have been challenged before. Their achievements are a matter of record. For example, the steadily increasing health problems of the aging and chronically ill have led Ohio health departments to forge ahead in this new field of health activity. "Programing in Long-Term Illness and Aging" was discussed at this annual conference 2 years ago. Since then some of the best diabetes programing in the country has been accomplished in this State. In addition, exploration with such new programs as glaucoma casefinding and meals-on-wheels has been carried out.

### Continuing Responsibility

But the control of infectious diseases is a continuing responsibility. A few years ago Dr. Karl F. Meyer delivered the sixth R. E. Dyer lecture (1) at the National Institutes of Health and discussed the natural history of plague. He said: "For centuries, man's survival has been chaotically interfered with by the infectious diseases, in pandemic form, dramatically. In the last half century, man, through his intelligence and diligence, has begun to control this chaos effectively for the first time. . . . These advances are good cause for great rejoicing. They are not cause for believing that parasitism holds no further challenge to man's ingenuity. . . . Immunization . . . chemotherapy . . . both of these defenses, magnificent but temporary, leave the parasite free to carry on its usual latent existence untouched: to multiply, to adapt, and to exert its capricious effects on the hosts. . . . The ever-

lasting question, what forces create, maintain, and suppress epidemic diseases of man and animals, has never been fully answered."

That infectious diseases go through cycles is widely recognized. Plague reached catastrophic proportions during the Renaissance. Syphilis spread as an epidemic during the 16th century. Smallpox was the scourge of the 17th and 18th centuries. The bacterial diseases, such as tuberculosis, diphtheria, and scarlet fever, next came on the scene and began to recede only as late as the early part of the 20th century. Virus diseases, exemplified by the pandemics of influenza which have occurred in the last 40 years, are among our greatest causes of concern today.

One of the earlier and more specific statements expressing this problem was made by William Parr in 1873 in a letter to the Registrar General as quoted by Hirsch (2): "The infectious diseases replace each other and when one is rooted out it is apt to be replaced by others which ravage the human race indifferently whenever the conditions of health are wanting. They have this property in common with weeds and other forms of life, as one species recedes another advances."

Dr. Rene J. Dubos in his extremely thoughtful treatise, "Medical Utopias," writes (3): "In the field of infectious disease, we need not go far for examples because the future is already with us. While mortality from acute bacterial infections is at the all-time low, chronic disorders of complex and ill-defined microbial etiology loom larger and larger on the horizon."

Therefore, we may postulate that as the health profession solves one problem through research, this very advance may create new biological equations which require solutions. The genetic instability of infectious agents with reference to chemotherapy or to spontaneous mutations provides examples. Another variant is the changing pattern of reservoirs of infectious agents. As long as a potential agent of disease continues an uninterrupted natural cycle, it may remain nonpathogenic or only mildly invasive. However, the current mobility and numerical growth of our population, the substantial changes in domestic and wild animal



life moieties, the altered nature of land usage, and many other developments tend to disequilibrate these relationships. The result is a continuous "spinning off" of newly invasive agents which are disease producing to various degrees. This pattern of biological adjustment will probably go on indefinitely.

Man's only safety from natural or overt biological warfare is the lead time achieved by research. This lead is precarious. The recent emergence of staphylococcal strains, for example, marked by their communicability and virulence and by high resistance to antibiotics, is recognized in many hospitals as the most immediately urgent of all infectious disease problems (4). The resistance of the anopheline mosquito to insecticides is a major threat to success of worldwide malaria eradication programs (5).

In my opinion methods of control can be found for almost any pathological state, but we cannot be complacent. Disease agents will change through the adaptive reactions demanded by their environments. We must maintain a constant research effort to gain adequate knowledge about infectious agents and their ecology. We must be able to understand the manner in which men respond to the infectious challenges which continue to arise from the environment.

### Advances in Microbiology

The National Institute of Allergy and Infectious Diseases has reported recent work that shows we are moving forward in our understanding of microbiology. The implications in terms of future public health programing can be envisioned.

In collaboration with the Children's Hospital Research Foundation and the Washington, D.C., Welfare Department, Dr. Joseph A. Bell and his associates have demonstrated an epidemiological technique for intensive, detailed study of respiratory virus infections in a small population. They have traced a panorama of so-called undifferentiated respiratory illness, such as those caused by adenovirus, Coxsackie virus, and others. These studies in nursery and hospital groups have aided in the definition of the place of a new microbial group, the myxo-

viruses, in respiratory disease. These newly recognized agents were found to have caused more acute upper respiratory disease in the study group than Asian influenza during the pandemic year 1957 (6).

In collaboration with the animal research services of the U.S. Department of Agriculture, Dr. Robert J. Huebner and Dr. Francis R. Abinanti have demonstrated that parainfluenza virus occurs extensively in cattle. Preliminary studies (7) show a relationship of this virus to costly bovine respiratory diseases, particularly shipping fever. This may be a lead to recognition of a new animal reservoir of infectious agents which cause respiratory disease.

Dr. Sarah Stewart, National Cancer Institute, Dr. Bernice Eddy, Division of Biologics Standards, and their co-workers revealed a filtrable agent associated with tumor formation in mice (8). Huebner, Dr. Wallace Rowe, and associates (9-11) have applied precise virological methods to this mouse polyoma virus and have characterized it immunologically. They demonstrated its excretion in saliva, urine, and feces of infected mice, established its spread among mice by respiratory and intestinal routes, and showed it to occur as a contaminant of numerous transplantable tumors. The observations are pertinent to study of possible virus etiology in human cancer.

Dr. Carl L. Larson, Dr. Edgar Ribbi, and co-workers of the Rocky Mountain Laboratory in Hamilton, Mont. (12), have reported a method for harvesting cell walls free of contamination with cellular protoplasm. Fractionation of tubercle bacillus cell walls suggests a more effective, less toxic immunizing antigen can be obtained free of material which causes delayed hypersensitivity.

Perhaps these examples of research represent studies too intensive or specialized for the average health department to undertake, but, as I have suggested, there is a need and a role for the health department investigator in medical research.

### Applications for Grants

The application for a grant from the National Institutes of Health for research or training begins with the individual investigator. Thus,

as a basic policy, the subjects of study are not prescribed, but instead follow the interest of the scientists themselves.

The application should be sponsored by the investigator's institution, since decisions must be made as to the adequacy of the research facilities available. When a grant application is received by the Institutes' Division of Research Grants, it is assigned to 1 of 33 study sections. These are composed mainly of scientists from universities and medical schools. They assess the competence of the applicant and the merits of the proposed research.

Next, the application is considered in the light of the total research program of the institutes. The matter is then brought before one of the nine National Advisory Councils, composed of non-Federal leaders in science and public affairs. The councils have two functions: they review the actions of the study sections and make final recommendations to the Surgeon General of the Public Health Service, and they advise on general program policy questions.

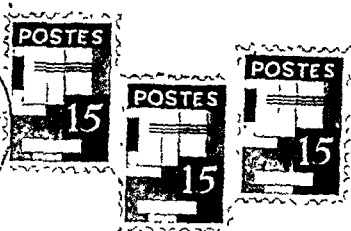
Following council recommendations, the Surgeon General approves or disapproves the grants. If the decision is favorable, the Division of Research Grants handles the mechanics of payment.

So far as I have been able to determine, more professional and scientific people have participated in this program through membership on advisory councils and study sections than in any other medical research program in history. This broad participation by the scientific community is, we think, one of the great strengths of the extramural grants program.

In summary, it has been my purpose to describe the research grants program of the National Institutes of Health, to point out the health department's unique opportunity for productive research in the natural history of disease, and to explore the concept that infectious disease research today is prologue to the control measures of tomorrow. I am sure that great new challenges and opportunities for service lie ahead for the public health departments.

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## Noncoercive Campaign

Reduced consumption of wine in 1959, which had been steadily increasing since 1946, and a 25 percent drop in deaths directly attributable to alcohol marked the first victories in France's noncoercive campaign against alcoholism. It has been estimated that 10 percent of the men and 3 to 4 percent of the women are excessive drinkers.

The campaign against alcoholism has three major facets: a public appeal to promote moderation, increased sales of nonalcoholic drinks at reasonable prices, and the prevention of economic dislocation in a major industry.

For several years demographic specialists, physicians, and sociologists, under the aegis of the Alcohol Research and Information Council, an organization created by the office of the Prime Minister, have been working with services of the Ministry of Health; the Committee for Protection against Alcoholism, a voluntary organization; and the Social Security Service.

Studies in 1955 and 1957 revealed that 7 out of 10 Frenchmen believed that the campaign against alcoholism was necessary, but that aperitifs and spirits were to blame for the damage caused by alcohol. The public also honestly believed that an average of 2 or 3 liters of wine per day was reasonable consumption.

This has been termed a fallacy, for alcoholism in France is primarily a matter of wine drinking; 70 to 80 percent of the 30 liters of pure alcohol that the "average Frenchman of the statisticians" absorbs annually are in the form of wine. Therefore, the public appeal was aimed at moderation in wine drinking. The maximum quantities suggested were 1 liter per day for a heavy laborer, three-fourths of a liter for a less active worker, and a half a liter for a sedentary worker.

A measure of the success of the public appeal was the fact that 8 out of 10 people who had heard of the campaign understood correctly that its aim

was moderation, and half of these knew that a liter was the maximum quantity that should be drunk each day.

Other indications were more definite. Mortality rates from alcoholism decreased in 1958 after increasing 12 times from 1946 to 1956. Mortality rates from cirrhosis of the liver, which had increased six times over the same 10-year period, were 12 percent less. Consumption of aperitifs has been decreasing since 1952. Consumption of wine dropped 500 million liters between 1956-57 and 1958-59, and the trend is continuing.

Drinking of fruit juice, still relatively modest, increased 30 percent per year over the same period. The council announced that an important firm of fruit juice distributors was launching a campaign to sell grape juice at 25 cents a liter, and an important wine cooperative intends to market its own grape juice at a price not more than that of wine.

The economic effects of reduced consumption will have to be offset by increased exports of quality wines and spirits. It has been calculated that an 8 percent reduction of consumption of these better qualities within France would enable the profits from exports to be doubled.

—Excerpted from *World Health*, January-February 1960.

## Sleep Brigades

In Cabinda, a wedge of Angola north of the Congo River, five mobile groups called sleep brigades battle the scourge of sleeping sickness. Each group consists of a physician, 2 nurses, 21 microscope technicians, 10 sanitary workers, an administrator, 3 drivers, and 12 servants. In the period from 1949 to 1958 the number of persons with the disease dropped from 15,785 to 917. In some years 5,000 to 6,000 people were examined.

Sleeping sickness, which once dominated nearly 5 million square miles south of the Sahara, is receding. Although some regions are still deserted, the spread of the disease has been stopped as far as man is concerned. However, it still affects cattle; nagana, as it is sometimes called, hinders the development of cattle raising.

—Excerpted from *World Health*, November-December 1959.

## Infektsionnye Psikhozy

### Infection Psychoses

T. P. SIMSON

The original article in Russian appeared in *Zhurnal nevropatologii i psikiatrii imeni S.S. Korsakova* (*Journal of Neuropathology and Psychiatry imeni S. S. Korsakov*), volume 56, pages 389-394, 1956. It was translated by the Russian Scientific Translation Program of the National Institutes of Health, Public Health Service.

**I**N the evaluation of the acute infection psychoses, Soviet psychiatrists adhere to the point of view that the character of the external influence is not immaterial to the structure of the pathological conditions which are combined under the name "exogenous psychoses" and that definite typical main syndromes are characteristic of various infections (1-3). However, it is becoming progressively more obvious that the characteristics of the clinical picture at various stages of the course of the process, chiefly during the initial period and during the final period of the disease, are of much greater significance in establishing the typical features of one infection psychosis or another.

At the height of the infection psychosis, when various phases of protective inhibition of the cerebral cortex are observed, the psychotic states induced by various infections are very similar.

Previously, Bonhoeffer's conception predominated abroad. There are certain disagreements between authors on the problem of pre-

disposition. Stransky, based on the Meinertian "amentiagrupp" nomenclature, combines the acute infection, the toxic psychoses, and even psychoses occurring on the background of somatic diseases and exhaustion in this group (4). Stransky sees no essential differences within this broad group, and if any are found they are determined, in his opinion, chiefly by the individual characteristics of the personality.

The condition known by the name of "acute delirium" (*delirium acutum*) has been attracting the special attention of both Soviet and foreign authors. A number of authors express doubt that this condition belongs to the schizophrenia group ("fatal" or "hypertoxic" schizophrenia). In the observations of Ageyeva, Arutyunov, and Slutskina (5), some of the patients with "acute delirium" had in the past had a mental disease; acute delirium occurred in the patients in a temporary association with the infection and was, in the author's opinion, an allergic reaction on a pathological background. Histopathological examination of the brains of patients who died from acute delirium showed that in the severe forms of this disease there are signs of long-existent pathology along with the acute changes (perivascular edema, hemorrhages, swelling of nerve cells): hyperplastic changes of the pia mater, thickening of the adventitia of the small vessels, hyperplasia of the glia; that is, two processes: a new one and an old one. The infection had acted on a pathologically altered background.

The opinion was expressed that psychoses which occur in connection with streptococcal, staphylococcal, colon bacillus infections, that is, with the ordinary "pyogenic" infections, correspond to the concept of "acute schizo-

phrenia" (6); these may show the picture of "acute delirium," which is erroneously taken for "acute," "very actively progressive," "fatal" schizophrenia. In patients with the picture of "acute delirium," hemolytic streptococci, staphylococci, and colon bacilli with pathogenic properties have been isolated from the blood and sometimes from the spinal fluid. In the presence of a fatal outcome the same microbes have been cultured from all organs, including the brain.

Belsanti distinguishes symptomatic acute delirium associated with definite known causes and essential delirium which is underlaid by three factors—toxic, constitutional, and emotional (7). Both variants of "acute delirium" are associated with an inborn hyperactivity of the cerebrospinal reticular system. Essential delirium is distinguished from symptomatic delirium by the stormy course of the symptoms in the absence of infection or azotemia associated with the hyperproduction of gluco-corticoids which cause protein decomposition. Massive hemorrhages are found in the suprarenals; in the brain, slight inflammatory and acute degenerative changes. The author mentions the progressively increasing azotemia in cases of acute delirium, although in individual patients it may be absent.

On the basis of a study of the brains of 30 patients who died from delirium acutum, Bom emphasizes the importance of hyperactivity of the hypothalamus, which leads to exhaustion of this vitally important center (8). An increased vacuolization occurs in the paraventricular nucleus and supraoptic nucleus, and chromophobia is noted in the ganglion cells.

In the literature there are indications of the presence of a disseminated degenerative process in delirium acutum, chiefly in the area of the third ventricle, which is manifested in the form of small perivascular hemorrhages.

All the authors mentioned agree on the fact that in "acute delirium" the adaptive functions of the organism are impaired. Lingjaerde believes that in "acute delirium" we can speak of a psychosomatic process which is expressed in a reaction similar to a crisis in Addison's disease (9).

While justified in many cases of delirium acutum, the arguments of a number of authors

for the inflammatory nature of this disease do not necessarily eliminate the concept of a fatal schizophrenia.

Rozenberg has done considerable work in the study of the characteristics of psychoses in the chronic and latent infections (10,11). An analysis of the data of his observations on patients with conditions such as malaria, brucellosis, tularemia, rheumatic fever, and wound infections, has shown that chronic infectious psychoses are characterized by a distinct picture which approximates them to the so-called exogenous psychoses. Their course may be remittent, intermittent, or relapsing.

Repeated psychoses not uncommonly occur in the presence of a weak general somatic reaction; increase of the latter can sometimes eliminate the psychosis. The pathogenesis of these psychoses is complex; here, there are also allergic signs as a result of sensitization of the organism and weakening of the cerebral cortex under the influence of prolonged stimulation, which brings about an inadequate neural regulation of somatic processes in the organism.

The condition of the defensive mechanisms, the type of nervous system, the sensitization by a series of external, even if minimal, influences during the life of the patient are of particular significance in chronic infections accompanied by somnolence. According to A. Z. Rozenberg's observations, in those patients in whom anxiety-depressive, depressive-hallucinatory, depressive-hypochondriacal states, or paranoid or catatonic syndromes predominated in the picture of the psychosis, consciousness remained intact. Psychosis initially can be manifested in very acute pictures, can proceed subacutely, and finally, in a wave-fashion, gradually becoming quiescent; as a result of it, residual encephalitic states may occur.

The periodicity of the course may be explained, in the author's opinion, on the basis of N. S. Vvedenskiy's teaching of parabiosis. The summation of prolonged and weak stimuli leads to the periodic occurrence of parabiotic inhibition. In the presence of an alternating course, contrasting states alternate: manic and depressive, stuporous and expansive. The author believes [it is hard to agree with this] that whereas the central nervous system shows a reaction in a somniferous infection, the somatic sphere is

apparently not involved; allergic reactions (such as blood changes and erythema) are distinctly expressed. Among the latent infections on the background of which psychosis has arisen, mention is made of osteomyelitis, malaria, brucellosis, and infection of unknown etiology.

Of 100 patients observed by the author, 42 became sick repeatedly, which attests to the marked change in their reactivity. Freezing, burns, bruises, and excitement contributed to the occurrence of the psychosis.

The author separates the chronic psychoses in latent infections both from schizophrenia and from manic-depressive psychosis, advancing such criteria as fatigability, somnolence, hallucinatory experiences at night, lability of the emotions, polymorphism of the clinical picture, etc.

By establishing the general rules and regulations of the course of psychoses in latent infections, A. Z. Rozenberg certainly does not deny the unusualness which various infections introduce into the clinical picture of psychosis. He mentions typical features proper to psychosis in chronic malaria, tularemia, rheumatic fever, tuberculosis, and suppurative infections.

A study of psychoses in infections of chronic course is being extensively carried out abroad. However, we have encountered almost no comparative evaluation of these psychoses from the point of view of the typical character of certain clinical pictures for one or another infection. This is demonstrated by the evermore considerable popularity of Bonhoeffer's concept.

Chistovich and his co-workers are trying to approach the problem of schizophrenia on the basis of a study of infections. The author believes that during psychoses in conditions such as brucellosis, rheumatism, and suppurative infections, it is possible for schizophrenic disorders to arise with transition into schizophrenic damage. The author has in mind grave chronic psychoses with the prolonged sluggish course of rheumatism in tonsillitis, in otogenous and postnatal infections (12), and in streptococcal and staphylococcal infections.

Chistovich (6,13,14) believes that the psychosis which develops in chronic infections, which represents "a model" of schizophrenia,

is in no way different from "the original"; that "fatal," "very active" schizophrenia is an acute toxic-infectious septic psychosis with a hyperergic reaction and the depression of all the defensive functions of the organism.

In Gruhle's work, "Symptomatic Psychoses," attention was given to the so-called "symptomatic" schizophrenias (15). The author distinguishes the following: exogenous diseases combined with real schizophrenia; diseases in which a latent schizophrenic process is shown; diseases in which a readymade syndrome of schizophrenic character is found in a disturbed personality; diseases producing schizophrenic symptoms.

The author believes that only in the last case should we speak of symptomatic schizophrenia. We can hardly agree with these views.

Of the various infections to which considerable attention has been given in recent years, rheumatic fever should be put in first place. As is well known, rheumatic fever morbidity, which decreased during the war years, has subsequently increased. In the Soviet literature a number of works have appeared in which, in addition to a study of the rheumatic psychoses from new theoretical standpoints, the psychopathology is presented in chorea minor and in the nonchoreic forms of rheumatic brain disease (6, 9, 16-20).

Rheumatic psychoses most often occur stormily; however, chronic rheumatic psychoses are also encountered which sometimes pass into a mental deficiency stage.

In the acute phases of rheumatic psychoses the most frequent syndromes are the following: depressive-hypochondriacal, hallucinatory-paranoid, and catatonic. The latter is most often encountered in chorea minor (16, 17).

Disturbances in consciousness are characteristic of the acute stages of rheumatic psychosis. At first, these are dreamlike, oneiroid states which occur in connection with the transition into the sleep; afterwards, the periods of disordered consciousness lengthen, including the daytime hours. Sometimes, elements of delirium are noted. The disturbances mentioned not uncommonly are replaced by stupefaction; sometimes, a catatonic state occurs. Emotional disturbances are typical of rheumatic

psychosis—*anxiety, fear, dejection, and paroxysmal disturbances of sensory synthesis. Hypochondriacal disorders, at the basis of which lie changes in intero-, extero-, and proprioception, are very typical.*

Afterwards, only depressive-hypochondriacal, hallucinatory-paranoid, and catatonic syndromes are manifested distinctly. The psychosis sometimes acquires a considerable similarity to schizophrenia; nevertheless, a number of criteria have been distinguished for the purpose of differential diagnosis (16).

The course of the psychoses is undulant, which is apparently characteristic of allergic conditions. In various cases the psychosis can lead to mental deficiency; however, usually it lasts from several months to a year or more and ends in recovery.

Study of higher nervous activity has made it possible to establish the fact that the toxic-infectious principle produces a protective inhibition in the central nervous system with various phasic states, the clinical expression of which is a whole gamut of disturbances in consciousness—*stupefaction, oneiroid, and delirium states (18, 19, 21).*

In the works of Polish authors—Kolakowska (22, 23), Sinchninska (24), and others, attention is directed both to the psychopathological changes in rheumatic disease and to rheumatic psychoses.

Scheidegger presents data concerning the histopathological examination of the brain in acute rheumatic psychosis which show that rheumatic inflammation of the brain (granuloma of the vessels and intravascular infiltrates) involving chiefly the brain stem underlies it (25). However, similar changes are also observed in the cerebrum.

Facts reported by Bruetsch are of interest (26). The author has found structural changes in schizophrenia specific for rheumatic disease (in agreement with what Beletskiy and Avtsyn (27) and Skobnikova (28) reported in their time).

Much attention has been devoted to the psychic disorders in tuberculous meningitis (29–31). All the authors agree that various types of disorders of consciousness (stupefaction, oneiroid states with striking fantasy experiences, visual illusions, twilight states, and

coma) are typical of the acute phase of tuberculous meningitis. Because of the extensive application of antibiotics, two-thirds of the patients recover; this permits a study of the dynamics of the psychotic states.

Long-lasting but not always gross disorders of consciousness with subsequent prolonged amnesia should be considered characteristic of the course of tuberculous meningitis. In patients who apparently have been fully conscious for a long time, amnesia is noted in connection with the events of this period. In the presence of the memory disorder the intellect as a whole practically does not suffer at all. Pathological changes are particularly pronounced in the brain cisterns.

In the field of children's diseases much attention has recently been given to mumps virus meningitis and to chickenpox encephalitis (32–35). In the former, very severe headaches, a marked degree of clouding of consciousness, sleepiness, and an impairment of sensory synthesis are noted. In chickenpox encephalides not uncommonly a picture of a severe comatose state occurs with convulsive attacks. On the basis of his own observations, Nilsly asserts that in chickenpox encephalitis a toxic-allergic reaction of the vascular wall occurs with secondary cerebral involvement (36).

In recent years, the psychopathology of measles (including acute psychotic states) has been worked out in detail, and psychopathological disorders typical of various phases of the course have been established (37). Abroad, this problem has been studied by Solomon, Makman, and West (38), but without any attempts at distinguishing the features typical of this infection.

The problem of dysenteric and scarlatinal psychoses is being worked out (39).

In the acute stage of the disease it is hard to draw a line between the toxic-infectious psychoses, where the psychosis occurs on a background of intoxication, and the psychoses which develop on the soil of encephalitis primarily or secondarily affecting the central nervous system.

The neurological symptomatology is the most reliable criterion, but it can also be transitory and does not always serve as a true sign of organic involvement of the brain. It should be

kept in mind, as I. P. Pavlov often emphasized, that there is a possibility of transition of functional into organic, and it is difficult to set a boundary line between them.

In the solving of the problems of infectious psychoses by Soviet psychiatry, pathophysiological methods of investigation are being used on a progressively broader scale with the application of the motor method and speech reinforcement in the A. G. Ivanov-Smolenskiy method, the salivation method, chronaximetry, and electroencephalography (21, 40, 41). The comprehensive study of mental disorders in infections is being conducted in a progressively more complete fashion (for example, the comprehensive study of children with a neurovirus infection occurring with sensory disorders). The reactivity of the body is being studied widely. All this is making it possible to investigate more thoroughly the pathogenetic mechanisms in the infectious psychoses and the defensive properties of the organism.

The treatment of the infectious psychoses is various. In those cases where the character of the infection is known, casual therapy is prescribed; recently, various antibiotic combinations are being used more and more extensively. In the acute stage of the psychosis, along with the fight against dehydration of the body and regular diet, antihistamines and suprarenal and sex hormones are being used. According to the data in the literature, cortisone has proved to be particularly effective in intensifying the adaptive mechanisms of the organism (9). Electric shock, cardiazol shock, insulin coma widely used abroad for the treatment of acute infectious psychoses cannot be convincingly grounded theoretically.

Further study of the infectious psychoses should proceed along the lines of establishing the typical features introduced by various infections into the clinical picture of the psychosis (careful study of the pathomorphological changes proper to infectious psychoses of different etiologies is also needed) and along the lines of perfecting the pathophysiological, biochemical, and immunological methods of study which will permit us to become more familiar with the pathogenetic mechanisms of infectious psychoses and to elaborate rational methods of therapy on this basis.

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# Preliminary Report of Human Staphylococcal Infection Associated With Mastitis in Dairy Cattle

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THE emergence of strains of antibiotic-resistant staphylococci producing epidemics and endemics of suppurative disease in hospital patients and hospital personnel and spreading from them into the community prompted the Public Health Service and the National Research Council to sponsor the first National Conference on Hospital-Acquired Staphylococcal Disease, held in Atlanta, Ga., September 15-17, 1958. At this meeting Dr. Leroy E. Burney, Surgeon General of the Public Health Service, and others emphasized the hazard of antibiotic-resistant epidemic strains spreading to the community (1).

## Staphylococci a Frequent Cause of Mastitis

Staphylococci have long been recognized as important in the etiology of mastitis in dairy cattle. Investigations have also revealed that these organisms are frequent inhabitants of apparently normal bovine mammary glands (2). Improper use of milking machines and other poor husbandry practices can cause trauma to glandular tissue, development of infection, and

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spread of pathogenic organisms through the herd (3, 4). A wide variety of antibiotics are frequently and often indiscriminately used by dairymen to treat animals suffering from mastitis. This creates an environment suitable to the development of pathogenic staphylococci resistant to antibiotics and an opportunity for cross-infection in the herd.

Recognizing this problem, the division of animal husbandry of the Hawaii Board of Agriculture and Forestry and the division of sanitation and bureau of laboratories of the Hawaii Department of Health conducted a limited survey to determine what bacteriophage types of coagulase-positive staphylococci are present in the milk of some dairy cattle on Oahu. During this survey, epidemic strain phage type 80/81 was found in the milk from four dairy cows—three in one herd.

The following report, believed to be the first of its kind to appear in the literature, describes investigations that associate human infection with mastitis caused by type 80/81 in dairy cattle.

## Cows and Humans Found Infected

Upon finding that mastitic mammary secretions from at least three cows in one dairy herd contained staphylococcus phage type 80/81, it was deemed advisable to separate these animals from the commercial herd and culture additional milk samples from them as well as other animals in the herd showing evidence of mastitis. The dairy employees were also given bacteriological examinations.

Nasal cultures were performed on 11 employees working directly with the cattle. These workers were questioned about current and past disease indicative of staphylococcal infection. Six of these men were found to have paronychia on one or more fingers. This was attributed to frequent contact with disinfectant solution (chlorhexidine diacetate) necessary during milking. Specimens for culturing were also taken from the finger lesions. Only one employee gave a history of a frequent occurrence of furuncles or other diseases that could be attributed to staphylococcal infection. This employee had a large draining furuncle on his back

at the waistline, approximately 3 inches lateral to the spinal column. Exudate was collected from this lesion the same day that nasal culturing was performed. In addition, samples of disinfectant solutions used in the milking parlor and swabs from hose nozzles frequently handled by the employees were taken for bacteriological examination.

Nasal cultures from four employees yielded coagulase-positive *Staphylococcus aureus*, with one strain identified as phage type 80/81. This strain was from the anterior nares of the employee whose furuncle exudate also yielded type 80/81. *Staphylococci* were not isolated from any of the other specimens.

The antibiogram of these human 80/81 strains—resistant to chlortetracycline, oxytetracycline, tetracycline, and dihydrostreptomycin but susceptible to penicillin, chloramphenicol, oleandomycin, bacitracin, neomycin, carbomycin, and novobiocin—was identical to all of the bovine 80/81 strains isolated except that the bovine strains had some resistance to penicillin.

### Infection in the Dairyman's Family

Further questioning of the employee found to have type 80/81 infection revealed that he had frequently experienced boils and sore throat during the previous 9 months, starting 3 months after his initial employment by the dairy. He further stated that his wife was currently afflicted with a boil and that his only child, an 18-month-old boy, had been experiencing a chronic sore throat for approximately 3 months and had only recently responded to medical therapy. (It was subsequently learned that the boy had responded to oleandomycin.)

The entire family was advised to seek medical care, and they elected to go to one physician. The father was given a course of TAO (tri-acetyloleandomycin), 1 gm. per day for 4 days. Cultures of nose and throat specimens taken shortly thereafter were negative for staphylococci, and there was no clinical evidence of new furuncle formation. Two weeks later the patient was given a course of chloramphenicol (same dosage schedule as TAO) which was again followed by negative nose and throat cultures. The second course of antibiotics was

thought to be advisable as a prophylactic measure since it was learned that the other members of the patient's family were also infected.

*S. aureus* phage type 80/81 was isolated from a furuncle on the right labium majus of the wife but not from nose or throat cultures. Subsequent cultures of nose and throat specimens following a course of chloromycetin were also negative, and her furuncle had healed.

*Staphylococcus* type 80/81 was isolated from the throat but not from the nose of the child. The antibiogram of this isolate was identical to those of the strains obtained from the mother and father. Another nose and throat specimen taken from the child 1 week after 2.5 gms. of chloromycetin had been administered yielded no staphylococci. Additional culturing of the dairy employee and his family is being planned.

Subsequently, two other employees were found to have experienced boils, but, unfortunately, they were discovered too late to obtain exudate for culturing. Additional nasal cultures from both of these men gave negative results.

### Cultures of Milk Samples

One of the three cows originally found to be shedding staphylococcus type 80/81 in her milk was sent to slaughter before additional milk samples could be obtained. An additional milk sample from each of the other two animals yielded type 80/81. One of these animals was slaughtered because of low productivity attributed to severe mastitis. The remaining infected animal was treated with intramammary infusions of neomycin under the direction of a veterinarian. After two such treatments, staphylococcus type 80/81 was not detected in milk samples taken from all four quarters, but in 10 days this animal was again found to be excreting staphylococci type 80/81 from one quarter. There was no clinical evidence of mastitis at this time and the milk appeared normal, but the animal was slaughtered because of greatly decreased milk secretion. Pathological and bacteriological examinations of the mammary gland are being performed.

Although it would have been highly desirable, it was not feasible to culture milk samples from every lactating cow in the herd because of the

comparatively large number of animals and the lack of laboratory facilities and personnel. Milk specimens collected from 100 cows or about 10 percent of the herd did not yield staphylococcus type 80/81.

Twenty-one bulk raw milk specimens were collected at different times from the holding vats at the dairy. Milk is cooled and stored in large tanks prior to shipment by tank trucks to the processing plants for pasteurization. Coagulase-positive *S. aureus* was isolated from 17 of these specimens, 13 of which were phage-typable. Two of the typable strains, isolated on separate occasions from the same vat, were identified as the antibiotic-resistant type 80/81 with antibiograms identical to the bovine 80/81 strains originally found. Type 6/42E/47/42B/42D/44A was found in five milk samples, and 42D in three samples. The three remaining isolations were of different types. The types other than 80/81 found in milk are not common to those found in man in Hawaii, and all were susceptible to the antibiotics tested, according to a personal communication from M. Levine and R. H. Tanimoto, bureau of laboratories, Hawaii State Health Department. The finding of phage type 80/81 in the bulk milk samples may indicate that animals not previously detected are shedding this organism or that one of the employees not known to be harboring 80/81 contaminated the milk. Investigations are currently being conducted to detect this source.

#### Source of Infection Unknown

The available information allows only speculation as to the original source of staphylococcus type 80/81 infection in the dairy herd studied. Coagulase-positive staphylococci have been found commonly in mastitic secretions of a large number of cows in the dairy herd under investigation. Although adequate records are not kept on individual animals by the dairy management, it was learned that prior to the discovery of type 80/81 staphylococci at the dairy, a wide variety of antibiotics had been used by intramammary infusion for the treatment of cows with mastitis. It is possible that the resistant strains developed in bovine mammary glands and are unrelated to the strains of

staphylococci isolated from the dairyman and his family. It is also possible that the human staphylococcal infection was contracted from the cows. The infected employee spent most of his working hours in the hospital barn where cows, including the ones found to be secreting type 80/81 staphylococci, were housed for treatment of mastitis and other ailments.

The third possibility is that the dairyman, or one of his family, contracted type 80/81 infection from an outside source and infected the cows. Except during the birth of his child 18 months previously, none of the family had a history of recent hospitalization. The hospital where the child was born, 9 months before symptoms of staphylococcal disease were evident in the father or mother (and 14 months in the child), has not been known to have a staphylococcal disease problem. Nevertheless, the child or his mother may have acquired the organisms in the hospital and remained asymptomatic carriers, or the family infection could easily have been acquired outside the hospital.

Phage type 80/81 has been the most common type associated with staphylococcal infection in humans in Hawaii. During 1958, phage type 80/81 accounted for 30 percent of coagulase-positive strains identified by the laboratory of the Hawaii State Department of Health. The next most frequent type found accounted for only 5.5 percent (M. Levine and R. H. Tanimoto, personal communication). Similar findings have been reported from other areas (5). Data on phage types found in cattle in Hawaii are limited to a relatively small number of herds and samples.

#### Increased Virulence and Communicability

Varying opinions appear in the literature concerning the communicability and virulence of staphylococcus type 80/81 as compared with other staphylococci. Blair states (5): "There appears to be little question that staphylococcus of type 80/81 probably possess enhanced virulence and a high degree of communicability . . . and is capable of producing a variety of clinical forms of staphylococcal disease." Wentworth and associates describe family infections persisting for as long as 4 years and requiring extensive medical care and hospitaliza-

tion. The cost to one family for antibiotics and medical care, exclusive of hospitalization, was estimated in excess of \$1,500 (6). Spink presents evidence that infections with antibiotic-resistant strains present more difficult therapeutic problems and appear to be causing a higher case fatality rate than infections with sensitive strains (7). Anderson (8) and Dowling (9) in separate reports recognized the seriousness of the antibiotic-resistant strains but pointed out the need for more information and better methods of determining invasiveness, pathogenicity, and virulence of individual strains.

The virulence and communicability of staphylococcus type 80/81 for dairy cattle and other domestic animals are not yet known, but it should be considered a dangerous organism with potential for causing serious disease in animals and subsequent economic loss to animal industry.

There are definite public health implications in finding staphylococci in dairy cattle similar to the human epidemic strains. Undetected infected animals may present an occupational health hazard and act as foci of infection for rural communities. The ability of Hawaiian strains to produce heat-stable enterotoxins has not been investigated, but this possibility reaffirms the necessity for strict enforcement of refrigeration requirements for raw bulk milk and enforcement of presently accepted time and temperature combinations used in pasteurizing milk.

### Summary

Three cows in one dairy herd were found to have mammary glands infected with the antibiotic-resistant staphylococcus phage type 80/81.

Subsequent investigations revealed one dairy

employee and his family to be suffering from staphylococcal disease caused by the same type. This organism was also found in 2 of 21 raw bulk milk samples collected at the dairy.

Treatment of the human cases is described as well as the therapeutic failure in preventing the excretion of type 80/81 in the milk of one dairy cow.

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*An Alabama study explores the attitudes of patients or their families toward a community mental hygiene program and evaluates the program's effectiveness in relationship to the source of referral.*

## Patients' Reactions to a Program in Public Mental Health

CARL A. F. HOLLER, M.D., MARTHA B. MUNDY, R.N., M.P.H., ROBERT G. HATTWICK, Ph.D.,  
and JEANNE P. NOOJIN

A MENTAL HYGIENE DIVISION was added to the public health program of the Etowah County (Ala.) Health Department on February 1, 1957. The clinic provides psycho-diagnostic and psychotherapeutic services to residents of Etowah County and surrounding counties, on a non-fee basis.

This study was initiated because the staff felt that an evaluation was needed for the purposes of determining whether the services were meeting community needs. The period covered was from February 1, 1957, to November 1, 1958.

A search of the literature shows a singular lack of studies of the evaluation of a public health service by the patients and their families.

### The Problem

The policy of the Etowah County Health Department is to make its personnel responsible for the mental health of the county as well as for the physical health. The ultimate goal is

to obtain an integration, on an optimum level, of both mental health and physical health services. In addition to the mental hygiene personnel, other health department workers can be utilized as a community resource for teaching, demonstration, and consultation in the area of prevention of mental illness and promotion of mental health. Because the local need cannot be satisfied by the limited personnel available for the clinic, clinical services have been, and will continue to be, principally diagnostic and recommendatory. This practice will necessitate followup by referral sources and other agencies. Therefore, this study was initiated in order to determine how patients of the clinic and their families accepted and evaluated clinic services and recommendations.

The data incorporated into this report are purely their subjective evaluation; no attempt is made to analyze the validity of their responses. This study has been helpful in identifying some of the areas in our mental hygiene program which, according to the reports of patients and their families, need improvement. Because of their reactions, possible changes in existing policies and practices are under consideration. Another benefit of this study is that the attitudes of those making use of mental hygiene services are made apparent. It is our

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belief that the effectiveness of such a program is dependent upon the acceptance of it by the local community.

The Etowah County Health Department is in northeast Alabama. The county ranks fourth in population for the State. The total population is 99,390, of which 85 percent are white. In addition, 36 percent of the referrals of the mental hygiene clinic are made by six surrounding counties which have a total population of 240,890 (1). Other services given by the health department are tuberculosis care, sight conservation, dental care, immunizations, statistical reporting, vector control, milk and food inspection, sanitation, bedside nursing, maternal and child health supervision, school health supervision, and control of venereal and other communicable diseases. The health department also conducts inservice education programs for public health nurses and sanitarians from surrounding counties.

### Procedure

This study is descriptive in nature and no attempt has been made to analyze critically the responses of patients and their families. It is an attempt to identify certain areas of acceptance and rejection of clinical services given by the mental hygiene division. The term "evaluation" as used in this study is the first of three levels defined by the U.S. Department of Health, Education, and Welfare, in "Evaluation in Mental Health" as: "An estimate which an individual or group places on an activity or service, what it means to the recipients according to their own value system. It should be added that this value system is not necessarily the same as that used by the State, Federal Government, or the scientist, in establishing a service" (2).

Initial plans for this study were made in June 1958. In a staff meeting the psychiatric social worker discussed with the public health nurses the possibility of a survey. It was decided that a questionnaire would be devised, and each of the participants submitted a list of questions which he felt would be pertinent. After careful consideration the group accepted 25 questions to be incorporated into the questionnaire. This preliminary form was sub-

mitted to the health officer for his recommendations and approval. As no funds were available, the possibility of hiring outside interviewers to accumulate the data was eliminated.

It was decided that the public health nurses would be the most effective group for use as interviewers. The group was aware that bias might be introduced, as public health nursing and the mental hygiene service represented the same official agency. Each nurse was encouraged to express her feeling and was given support and instruction in methods of collecting the data with a minimum of bias. The questions contained in the questionnaire were discussed in detail so that all the interviewers would interpret them on the same basis.

A pre-test of the questionnaire was made in mid-October, 1958, on 10 former patients of the clinic or their families. The questionnaire was then revised and reduced to 15 factual, open end, and multiple-choice questions.

On November 1, 1958, all individuals who had been admitted to the mental hygiene service from Etowah County, Ala., and whose case folders had been closed were listed. As nursing time available for this study was limited, the public health nurses were instructed to make only one visit to the home in an effort to interview the patient (if an adult) or the family. Of the 247 cases on file, 121 were interviewed. This number represented 49 percent of the total number of patients admitted to service. Of the total cases on file, 78 percent were children and 22 percent were adults. Of the 121 cases interviewed, 83 percent concerned children and the rest, adults. Ninety-three percent of the questionnaires were answered by family members and 7 percent by adult patients. The survey was concluded on December 31, 1958.

The responses made to the questionnaire have not been compared with the case records on file at the health department. The referral sources were not interviewed in this survey. Therefore, no attempt has been made to evaluate the validity of the information gathered from the patients or families.

At the time of this study, health department policy included five sources of referral. These were physicians, public health nurses, depart-

**Table 1. Method of referral to mental hygiene services, Etowah County Health Department, Ala., February 1957–November 1958**

Referral sources	Number	Percent
Physicians.....	12	10
Ministers.....	2	1
School.....	25	21
Public health nurses.....	26	22
Departments of pensions and security.....	31	25
Others.....	25	21

ments of pensions and security, schools, and ministers. However, it was found that other referrals had been accepted, such as self, mental health association, court, police, and others.

The largest number of referrals from any one source was from the departments of pensions and security, which referred 25 percent of the individuals seen by the mental health service (table 1). Ranking second were public health nurses, who referred 22 percent. Schools and other sources ranked third with 21 percent each.

The fact that physicians referred but 10 percent of the sample placed them in fifth position, and ministers had a negligible 1 percent. What

does this total of 11 percent from professional people (physicians and ministers) indicate. Is there a lack of understanding of the service? We question this conclusion, as two physicians have served as president of the Etowah County Mental Health Association, one as secretary, and there has been a mental health advisory board appointed by the Etowah County Medical Society. Has there been some lack of communication between the advisory board and the medical society as to the services provided by the mental hygiene division?

The 10 percent of referrals made by physicians represents 12 different individuals, which is approximately one referral for every three physicians practicing in Etowah County. However, it should be noted that these physicians, although they are aware of the service, have made limited use of it. As there are no psychiatrists or psychologists in private practice in this county, are patients being referred to the nearest community with such services, which is 65 miles distant, or is no service of this type being recommended? As 68 percent of the total referrals came from official agencies, does this indicate that tax-supported agencies tend to refer individuals to other tax-supported

**Table 2. Response to questionnaire by patients and families referred to the mental hygiene service, February 1957–November 1958**

Questions	Source of referrals (percent)						Percent of total
	Physicians (N=12)	Departments of pensions and security (N=31)	Public health nurses (N=26)	School (N=25)	Ministers (N=2)	Others (N=25)	
<i>Did you receive a report from the clinic?</i>							
Yes.....	92	71	85	76	50	44	67
No.....	8	29	15	24	0	52	27
No answer.....	0	0	0	0	50	0	0
<i>Did you understand the recommendations?</i>							
Yes.....	58	45	54	64	50	44	52
No.....	8	23	4	8	0	12	12
Partially.....	34	13	27	16	0	4	17
No answer.....	0	19	15	12	50	40	19
<i>Could you follow the recommendations?</i>							
Yes.....	34	29	27	52	0	16	31
No.....	34	29	15	16	0	12	21
Partially.....	25	23	27	8	50	8	18
No answer.....	7	19	31	24	50	64	30



agencies more readily than do other sources of referral?

Table 2 indicates that 67 percent of the 121 respondents reported receiving a report and an interpretation. This service was given either by the mental hygiene personnel, the referral source, or by a related agency according to the patients or family. Physicians ranked highest in this respect with 92 percent of the individuals stating that they had received a report. Public health nurses ranked second, followed by schools, departments of pensions and security, ministers, and others. An overall average for all referral sources was 67 percent who acknowledged having received reports.

What is the significance of the 33 percent for those stating that they did not receive a report from the division of mental hygiene or the referral source? What does this mean to us as a service agency in terms of effectiveness of service and public relations? Why did these patients or their families feel that no report was given? How do they interpret the term "report"? Is it possible to develop a method of communication with them that is meaningful? Is it of value to see these individuals if their comprehension of the recommendations is limited or nonexistent?

Answers to the question, "Did you understand the recommendations?" indicate that almost half of the patients or their families did

not fully understand or had no understanding of the recommendations (table 2). Does this lack of understanding result from the use of technical terminology, from lack of time spent with the families, or from lack of ability to meaningfully communicate the interpretation of the results? Is the service of benefit if the recommendations are not clear to the individuals involved?

Can the 31 percent representing those who were able to follow the recommendations in table 2 be interpreted to mean that this percentage of the sample was served adequately? Are recommendations offered beyond the comprehension of these individuals' intellectual, financial, environmental, and emotional levels? According to the sources of referral in table 2, physicians ranked first in imparting information in such a manner that the recommendations could be understood and followed. Schools ranked second, public health nurses third, departments of pensions and security fourth, and others fifth. The ministerial sample of two persons was too small to offer reliable information. Do the foregoing results indicate a need for specific referral sources who are aware of the type of services given by the clinic and who have the professional background necessary to interpret the recommendations to the patient and his family? Does this conclusion suggest that a study should be made as to the

**Table 3. Response to questionnaire by patients and families referred to the mental hygiene service, February 1957–November 1958**

Question	Clinic personnel or referral source reporting (percent)						
	Psychiatric social worker (N=41)	Psychologist (N=13)	Physician <sup>1</sup> (N=5)	Nurse (N=8)	Departments of pension and security (N=10)	School (N=3)	Other (N=3)
<i>Did you understand the report?</i>							
Yes.....	78	62	40	75	50	67	100
No.....	2	15	0	0	0	0	0
Partially.....	18	23	40	25	30	33	0
No answer.....	2	0	20	0	20	0	0
<i>Were you able to follow the clinic recommendations?</i>							
Yes.....	44	46	80	38	30	67	33
No.....	24	38	—	12	10	33	33
Partially.....	18	8	20	25	40	0	—
No answer.....	14	8	—	25	20	0	33

<sup>1</sup> Clinic psychiatrist and physicians.

**Table 4. Response to questionnaire by patients and families referred to the mental hygiene service, February 1957–November 1958**

Question	Number of clinic visits (percent)						Average
	I (N=73)	II (N=20)	III (N=7)	IV (N=12)	Don't know(N=7)	Not seen (N=2)	
<i>Did you receive a report from the clinic?</i>							
Yes.....	71	65	57	92	43	0	67
No.....	28	35	43	8	43	100	27
No answer.....	1	0	0	0	14	0	6
<i>Did you understand the recommendations?</i>							
Yes.....	52	60	70	67	0	50	52
No.....	12	0	0	8	0	0	12
Partially.....	15	10	0	0	43	0	17
No answer.....	21	30	30	25	57	50	19
<i>Were you able to follow the recommendations?</i>							
Yes.....	33	45	0	42	0	0	31
No.....	19	15	30	33	29	50	21
Partially.....	14	10	40	17	14	0	18
No answer.....	34	30	30	8	57	50	30
<i>Have you seen any change in the patient?</i>							
Yes.....	48	60	59	67	43	0	50
No.....	43	25	41	17	57	100	37
Slight.....	9	15	0	16	0	0	13
No answer.....	0	0	0	0	0	0	0
<i>Do you feel the patient has shown:</i>							
Improvement.....	66	80	86	100	29	100	72
No improvement.....	21	15	14	0	43	0	19
No answer.....	8	5	0	0	28	0	6
Don't know.....	5	0	0	0	0	0	3
<i>Was the clinic service helpful to you and your family?</i>							
Yes.....	58	60	59	75	14	50	62
Indifferent.....	4	0	0	0	0	0	14
No.....	33	30	41	17	29	50	17
No answer.....	5	10	0	0	57	0	7

validity of the referrals made to the clinic concerning the needs of the patients for the type of services given?

Evaluation of the ability of the patient and his family or both to understand the report is based on the professional status of the individual making the interpretation (table 3). Results are based on the 83 respondents who stated that they had received a report. This number represents 69 percent of the total sample of 121. From the results, it would appear that the psychiatric social worker was the most effective interpreter. Of those receiving reports, 67 percent felt that they understood the reports; 24 percent had partial comprehension; thus a total of 91 percent of the sample had some comprehension of the recommendations involved.

Of those receiving reports, table 3 shows that 49 percent were able to follow the recommendations and 15 percent were able to follow them partially. This number actually represents 40 percent of the total sample of 121 who could follow the recommendations and 11 percent who could partially follow them. Did the remaining 49 percent receive any benefit from services of the clinic? Despite the lack of an objective report of value received from the clinic, do they promote and support the mental health services? Do they feel that the clinic is meeting the community needs and support the expenditure of tax dollars for clinic services?

The fact that 60 percent of the sample visited the mental hygiene clinic only once and that 16 percent made only two visits (table 4) is sug-

gestive that those who report four or more visits show the greatest amount of improvement in the patient's adjustment. This suggests the possibility that the patients and their families or both need repetition of the recommendations and a more intensive workup.

### Conclusion

Some insight has been obtained into the conscious acceptance and rejection of the mental hygiene services of the Etowah County Health Department on the part of the patients and their families.

The information suggests a need for a thorough evaluation of clinic policies and techniques. The following areas should be explored: (a) types of referrals that can be adequately serviced by the mental hygiene clinic; (b) limitation of referrals to certain sources which can adequately interpret the results and follow through with the recommendations; (c) clear designation of responsibility for interpretation and followup service in each case; (d) better understanding by referral sources of the mental hygiene services available; and (e) clarification of the responsibilities of both mental hygiene personnel and the referral sources to the patient.

The referral sources thus would be better able to prepare the patients at the time of referral. They would also be able to interpret more effectively the results and to follow the patient after such clinic services have been terminated.

Our objective is the prevention of mental illness within the framework of public health. A purely clinical approach, on a one-to-one basis, does not appear to be feasible. This study points out that, at least in our community, only 31 percent of these individuals seen stated that they profited from the services. The program, as constituted at the present time, does not appear to satisfy the community needs either from a treatment or prevention standpoint. From a purely clinical viewpoint the results suggest the possibility that in many cases the service may have promoted frustration, indifference, and confusion, because of lack of transmission of the information to the patients or their families, or as a result of an inability to communicate the results to them. This suggests a need for intensive community education so that there is a better understanding of mental hygiene concepts among members of the community.

As a result of this study, the Etowah County Health Department is actively endeavoring to devise methods and techniques not only to improve clinic services, but also in the area of extra clinical functioning.

### REFERENCES

- (1) Alabama Department of Health: Vital statistics report. Montgomery, Ala., May 1959, p. 2.
- (2) U.S. Public Health Service: Evaluation in mental health. PHS Pub. No. 413. Washington, D.C., U.S. Government Printing Office, 1956, pp 17-21.

# *Poliomyelitis Vaccination*

**A**BOUT 5 years have elapsed since the inception of the national poliomyelitis inoculation program with the licensing of Salk vaccine for commercial production in April 1955. During the past 3 years, the Public Health Service has arranged for the annual collection of poliomyelitis vaccination information by means of household sample surveys of the national population. The surveys have provided national estimates of the number of persons by age groups of those who had not had any inoculations and those who had received one, two, and three inoculations.

This monograph presents the statistics derived from the survey conducted in August 1957, the first and most extensive of the national poliomyelitis surveys sponsored by the Public Health Service. The extent of participation of the population, as indicated by the number of inoculations received, is shown by age, family income, sex, marital status, color, geographic region, and type of area. These data have been used extensively for purposes of evaluating and planning the national poliomyelitis vaccination program. They are indispensable to epidemiological studies and studies concerned with the vaccine's effectiveness. They are also sugges-

tive of factors affecting the population's participation in preventive health programs.

The early priorities of the vaccination program were important factors in establishing, by August 1957, substantial differentials in participation between population groups. Participation (the proportion that had received at least one inoculation) was highest for children 1 to 19 years of age, particularly among those 5 to 14. The level of participation was about the same for infants under 1 year and adults in the age group 20 to 40 years. Within the latter group, participation decreased with advancing age. In the age range of highest fertility, there was a substantial difference between male and female participation, reflecting higher participation for women. These results were logical consequences of priorities of the vaccination program which selected persons 5 to 9 years of age as the initial vaccination target group and then gradually extended the priorities to include adjacent age groups and pregnant women. The first poliomyelitis inoculation was rarely administered during the 6-month period after birth, accounting for the low rate of participation in infants.

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## Public Health Monograph No. 61

**Population Characteristics and Participation in the Poliomyelitis Vaccination Program.** By Monroe G. Sirken and Berthold Brenner. Public Health Monograph No. 61 (PHS Pub. No. 723), 37 pages. U.S. Government Printing Office, Washington, D.C., 1960. 30 cents.

The accompanying summary covers the principal contents of Public Health Monograph No. 61, published concurrently with this issue of *Public Health Reports*. The authors are with the Actuarial Analysis and Survey Methods Section of the Na-

tional Office of Vital Statistics, Public Health Service.

For readers wishing the data in full, copies are on sale by the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. Official agencies and others directly concerned may obtain single sample copies without charge from the Public Inquiries Branch, Office of Information, Public Health Service. Copies will be found also in the libraries of professional schools and the major universities and in selected public libraries.

Within age groups, participation differentials were noted between geographic regions, areas of residence, and color groups. Generally, the proportion of the population that received at least one inoculation was lower in the South than in other regions, lower outside Standard Metropolitan Areas, and lower among the nonwhite population.

Participation in the inoculation program was strongly associated with family income. Although the pattern of participation by age was essentially the same within four broad income levels, the proportion of the population inoculated one or more times increased with income for virtually all age groups. The association between participation and income held for each region and area of residence. The relationship was much more marked for the white population than for the nonwhite population. In fact, among nonwhite children of school age, participation was not correlated with family income.

Of the 60 million persons vaccinated by August 1957, slightly more than half completed the series of three inoculations. The priorities of the vaccination program were quite evident in the differences between the age groups in the proportion that had completed three inoculations. Children in the age group 5 to 9 years had the highest completed participation rate, and those in the age group 10 to 14 years had nearly as high a completion rate. The rate was appreciably lower for preschool children and for persons 15 years and older, and it declined precipitously with advancing age. For the reproductive age groups, the completed participation rates were higher among women. Generally, completed participation rates were lower

in the South than in other regions, lower outside Standard Metropolitan Areas, lower among the nonwhite population, and lower for lower income families.

The population that had started but not completed the series of three inoculations (persons having received at most one or two inoculations) represented the current or more recent participators in the sense that they had received their first inoculation during a period that rarely extended more than a few months prior to the survey date. It is noteworthy that there was less disparity between adults and children in the proportion who had completed one or two inoculations than there was in the proportion that had completed three inoculations. For children under 20 years, the percentage that started but had not completed the series of three inoculations was about the same for preschool, school, and the 15- to 19-year age groups, although it tended to be slightly lower for the school-age group, 5-14 years, which had achieved the highest participation levels. Major differentials by geographic region, area of residence, color, and family income were not evident either. Apparently some major disparities in the levels of participation between the age groups under 20 years were not being increased further during the summer of 1957. At the adult ages, however, the reverse was noted—the disparities by age, sex, and color in the levels of participation appeared to be increasing.

A chronology of the major events and factors affecting the population's participation in the poliomyelitis inoculation program between May 1953 and August 1957 is presented in the appendix.

### Editor's Correction

In the article entitled "Relationship of Excess Weight in Children and Adults," by Sidney Abraham and Marie Nordsieck, *Public Health Reports*, March 1960, figure 1, page 268, should be captioned "Adult weight status of overweight children of both sexes, 10 to 13 years of age, Hagerstown, Md., 1937-39." Figure 2, page 269, should be captioned "Adult weight status of average weight children of both sexes, 10 to 13 years of age, Hagerstown, Md., 1937-39."

# Federal Publications

**Uranium Miners. Your ounce of prevention.** *PHS Publication No. 708; 1959; 16 pages; 10 cents.*

This pamphlet alerts uranium miners and operator-owners to certain occupational health hazards inherent in their jobs and informs them of necessary protective measures.

It is illustrated by line drawings and simple, brief descriptions of the hazards of radiation, silicosis, and dangerous gases and conditions are presented together with recommendations for their control.

**School Mental Health.** *PHS Publication No. 704; 1959; 11 pages; 10 cents.*

Program activities of the National Institute of Mental Health relating to school mental health are briefly described. A few examples of current projects are given for each program area.

A list of agencies designated as State mental health authorities and a list of the regional offices of the Department of Health, Education, and Welfare are included for the convenience of those who wish information on State school mental health programs.

**VD Fact Sheet, 1959.** Basic statistics on the venereal disease problem in the United States. *PHS Publication No. 341 (16th revision); 1959; 23 pages.*

Latest statistics on venereal disease incidence, prevalence, reported morbidity, mortality, and therapeutic methods are given. Information on trends in health departments' casefinding and epidemiological activities are also given.

Estimated cost of uncontrolled syphilis, current penicillin reaction studies, and other basic material complete the data.

**The Child With a Missing Arm or Leg.** Children's Bureau Folder No. 49; 1959; 23 pages; 10 cents.

Parents of child amputees are given practical information about

helping their children become independent by learning to use prostheses.

The folder emphasizes the importance of the use of prosthetic teams, including doctors, social workers, prosthetists, therapists, and nurses, in helping the child get a correct fitting and in training him to use the device.

**Milk Sanitation Administration. Selected lectures.** *PHS Publication No. 728; 1960; 208 pages.*

Administrative programs of the Public Health Service as related to State and local procedures for the milk industry are developed in detail. Separate lectures deal with the operational program of the Public Health Service and survey and laboratory certification procedures for interstate and intrastate shipments of milk and milk products.

Included are descriptions of recent research in the inactivation of pathogenic micro-organisms in milk and milk products exposed to ultrahigh temperatures. Other papers discuss animal diseases, vector control procedures, dairy plant sanitation, and noninfectious milkborne diseases.

Although developed primarily for State and local public health administrators, this syllabus should be useful to universities, the dairy industry, and the Armed Forces.

**The Public Health Nurse in Your Community.** *PHS Publication No. 47; revised 1959; 16 pages.*

This popularly written booklet tells of the role of the public health nurse as an indispensable member of the public health team in the prevention and control of disease and in the promotion and maintenance of good health at home, at work, and at school.

It was prepared as a reference guide for use in explaining to high school students, university students, and others the challenge of public health nursing.

**Heart Disease.** *PHS Publication No. 45 (Health Information Series No. 63); revised 1959; leaflet; 5 cents, \$2.75 per 100.* Directed to the general public. Briefly explains coronary artery disease, hypertension, and rheumatic heart disease. Stresses importance of regular physical examinations.

**Hypertension.** *PHS Publication No. 146 (Health Information Series No. 69); revised 1959; leaflet; 5 cents, \$2.70 per 100.* Describes in lay language what happens in hypertension, its symptoms, and methods of treatment. Discusses role of tension and stresses importance of medical care.

**Varicose Veins.** *PHS Publication No. 154 (Health Information Series No. 50); revised 1959; leaflet; 5 cents, \$2.25 per 100.* Simply written description of varicose veins, telling what is known about the causes of this disorder and about contemporary methods of treatment.

**Leptospirosis.** *PHS Publication No. 696 (Health Information Series No. 93); 1959; leaflet; 5 cents, \$2.50 per 100.* Directed to the general public, especially dog owners and others who may come in contact with the disease. Lists the animal carriers, of leptospires, the methods of spread from animals to humans, and symptoms of the disease in humans. Touches on treatment as well as prevention, stressing sanitation measures.

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This section carries announcements of new publications prepared by the Public Health Service and of selected publications prepared with Federal support.

Unless otherwise indicated, publications for which prices are quoted are for sale by the Superintendent of Documents, U.S. Government Printing Office, Washington 25, D.C. Orders should be accompanied by cash, check, or money order and should fully identify the publication. Public Health Service publications which do not carry price quotations, as well as single sample copies of those for which prices are shown, can be obtained without charge from the Public Inquiries Branch, Office of Information, Public Health Service, Washington 25, D.C.

The Public Health Service does not supply publications other than its own.

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# Echoes

## Nutrition for the Later Years of Life

By ANCEL KEYS, Ph.D.

"Nutrition for the later years of life" implies that older people have special nutritional problems simply because they are older. The suggestion is that dietary practices considered good for younger adults may not fit precisely the needs of older people. Actually, there is practically no evidence that age, by itself, produces nutritional problems which do not have their counterparts at all ages in adult life. However, the frequency of certain problems changes with age and there are some general trends which need attention from those who advise or care for elderly persons, as well as from the elderly person himself.

It is impossible to specify any particular age which this discussion applies, or begins to

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MAY 1952, pp. 484-489

Nutritional needs of older people are not different in kind from those of any age, Dr. Ancel Keys points out. They only differ in amount; proteins, fats, carbohydrates, vitamins, minerals, and salts all have their place in the diet.

# New Horizon in Mass Inoculation

RICHARD L. TOWLE, M.A.

MASS immunization programs are beset with many difficulties, not least of which is the time-consuming operation associated directly with inoculation of the vaccinee. Several years ago, U.S. Army scientists applied the jet injection principle (1) in the development of an automatic multiple-dose syringe (2) for immunizing large groups of people. This instrument, with some improvements, has been employed on a limited scale by the Armed Forces with encouraging results. The time required to vaccinate groups of men was much less when the jet injector was used than when the ordinary syringe and needle method was followed. Moreover, experience indicated that the immunological responses elicited by several types of vaccine administered by jet injection were comparable to those obtained by the usual methods (3-5).

It remained to be determined whether the procedure which seemed practical for large-scale immunization of military personnel might be equally useful for civilian groups. The present report describes the results obtained in mass immunization programs in Pakistan in which cholera and typhoid vaccines were administered to the civilian population by means of a Hypospray Multidose Jet Injector (4). This instrument is compact, fitting into a container the size of an overnight suitcase. Vaccine is forced through a minute aperture under sufficiently high pressure so that the jetstream penetrates the skin and enters the subcutaneous tissue. The vaccine,

in its course from the reservoir bottle to the aperture, remains in a closed, sterile system. Pressure for injection is applied to a plunger by release of powerful springs. Power for cocking the springs is obtained from a hydraulic system activated by an electric motor. The entire process of loading the discharge chamber with vaccine, cocking the drive springs, and inoculating the immunogen into the patient requires only a few seconds.

East Pakistan is one of the few remaining endemic areas of cholera in the world; the Province usually suffers over 15,000 attacks and 10,000 deaths yearly (6). It is probable that, owing to inadequate reporting of infectious diseases, these figures are not entirely reliable.

But it is known that cholera reaches two peaks during the year, the first in May prior to the onset of the summer monsoon rains and the second starting in September at the end of the monsoon and continuing through the months of October, November, and December.

Immunizations in East Pakistan, except during emergencies such as the 1958 smallpox epidemic, are carried on by the limited staff of the Directorate of Health Services. The population of East Pakistan is approximately 46 million people. There are about 400 sanitary inspectors, or about 1 per 100,000, each supervising 2 to 3 health assistants who are responsible, among other duties, for the complete immunization of the people. This means only 1 vaccinator and inoculator for approximately every 40,000 persons.

Immunization teams are handicapped by travel conditions. There are comparatively few roads, rail service is limited, and air service within each Province is almost nonexistent.

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*Mr. Towle is field sanitarian adviser with the International Cooperation Administration's U.S. Operations Mission to Pakistan, Dacca, East Pakistan.*



These limitations, coupled with the fact that most of the land is under water for several months during the monsoon, severely hamper the mobility of the health workers. Within each thana, a political unit of roughly 100,000 population, nearly all local movement is confined to foot or small country boats.

The psychological aspect of the use of the syringe and needle, itself is another obstacle to immunization. In any population of any country, many people actually shrink from not only the sight but the idea of the needle. This is especially true in East Pakistan where so many are comparatively uneducated villagers. In many areas they do not understand the nature of disease or preventive measures. Not understanding, they feel no stimulus to overcome the apprehension against the needle the way people might in other societies. The purdah system among the Moslem peoples further complicates matters by making it extremely difficult to reach the female element of the population.

Even the educated classes have misgivings about immunization because the majority of injections have been given with an unsterilized syringe and needle, with the risk of transmitting malaria, syphilis, or hepatitis, which are common in this part of the world.

Taking these conditions into consideration, the task remained to prove the utility of the machine in different areas and in various situations.

Initially, demonstrations of the machine were given to different groups. This was done to familiarize community leaders with the jet injector and to determine the reaction of the people toward this new method of inoculation. Demonstrations were given to doctors, medical students, civic groups, health workers, the military, students, and various women's groups in Dacca and throughout the Province. In all instances the reaction was highly favorable. The fact that no needle was used seemed to impress the people more than any other factor. Also encouraging were the numerous comments regarding the relative absence of pain and the speed of inoculation.

Although the general response to these numerous demonstrations was completely positive, the majority of these people were of the educated classes. It remained to be seen whether the re-

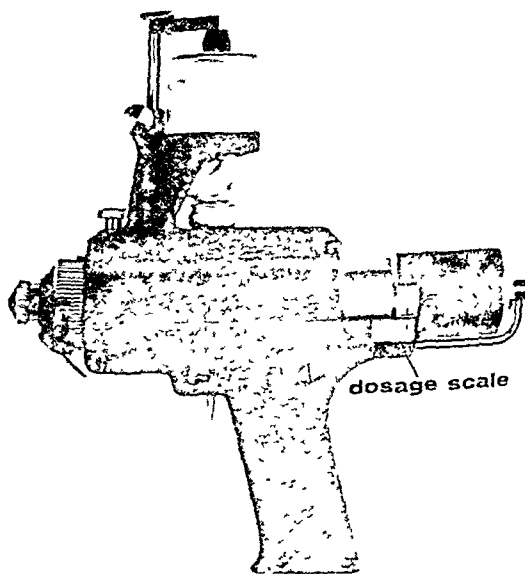
action would be as favorable among the less educated groups, to which most of the population of East Pakistan belong. These were the people exposed to disease, the ones who would determine the effect of immunization efforts.

During the following months, accompanied by a Pakistani team usually comprising a doctor and two sanitary inspectors, I took the injector into many areas of the Province, inoculating for cholera. We inoculated people in areas easily accessible, in some almost completely inaccessible, and in cities, small towns, and market areas. We tried to select places which would give us a cross section of East Pakistan.

### **Inoculations in Urban Areas**

In mass inoculation in city areas, it is thought that the machine proved itself without doubt. In most instances, inoculations were done from a station wagon equipped with a generator which provided electricity for the injectors and a microphone and speaker for publicity. There was no problem in attracting crowds; a constant line waited for inoculation.

An excellent example of the capability of the machines was shown in Dacca during the October-November mass inoculation program



**Hypospray Multidose Jet Injector**



against cholera. Thousands were inoculated daily, with two injectors in operation. The highest figure for 1 day totaled 6,759. Sanitary inspectors and doctors, working with syringe and needle during the campaign, were reporting about 100 inoculations per inoculator per day. It was clearly indicated that one injector could do the work of 25 to 30 men.

The only experience of inoculating with the injectors outside of East Pakistan was in the first week of July in Karachi, West Pakistan. Owing to excessive rainfall in June, much of Karachi was flooded. Nearly all of the refugee colony areas were under water, and there arose considerable danger of a typhoid epidemic. Thirty centers were set up throughout the stricken area for inoculation against typhoid fever, paratyphoid fever, and cholera. The injectors were brought from East Pakistan to aid in the fight. In  $4\frac{1}{2}$  days, with only one machine operating, approximately 20,000 persons

were inoculated. The entire staff of the 30 centers, inoculating by syringe and needle, were only able to inoculate about the same number during the same period.

As the work in a municipal area is carried on most successfully as an outdoor operation, most of the persons inoculated were men and children. Few women were reached in this situation because of the purdah system and the social restrictions on women moving about in public. To overcome this difficulty, we set up special centers in buildings for women only. Attendance depended greatly on selection of the site, time of inoculation, and adequate publicity.

The experience of inoculating in urban areas was highly encouraging. With adequate planning, there is no doubt that jet injection can be successful in treating most of a population's men, women, and children in a minimum of time, whether in an emergency situation or in routine preventive programs.

The hats, or market areas, of Bengal also provide excellent opportunity to reach the maximum number in the minimum period. These weekly markets attract gatherings ranging from a few hundred to as many as 20,000 people, according to their size, location, and importance. In a central location in the hat, even without publicity, it has been comparatively easy to inoculate 500 persons an hour with one machine.

The larger markets, such as the Ghior Hat located in Manikganj Subdivision, Dacca District, provide an excellent opportunity to reach many of the people who would be otherwise comparatively inaccessible and also at the highest risk. People come 40 or 50 miles to a hat to sell or exchange produce and animals. Many come by river boats, which constitute the major mode of transportation in the delta area. As most of these river people live on their boats and are constantly moving, it is practically impossible to reach them at any other time. The river satisfies practically all their needs for drinking, washing, and cooking water. All of the rivers are congested with these riparian rambles.

People living on or near the rivers, and their animals, use them for all purposes. Latrines overhanging the banks are a common sight. There is a chronic threat of infection therefore to the people living on or near the waterways.

Even though most of the people at the hats

are men and children, it is felt that, by the inoculation of this great mass of transients, it may be possible to break one of the more important links in the chain of disease, by means of the jet injector, the one instrument by which it is possible to inoculate enough of these persons quickly. The duration of these hats is only 1 day per week. If the people are not reached on that day, they may carry infection throughout the Province.

### Inoculations in Rural Areas

While there remains little doubt that the injectors can be used successfully in places, such as municipal areas and markets, where a great number of people congregate, the principal question concerns their utility in rural areas. In East Pakistan approximately 90 percent of the population of 46 million live in villages. It is estimated that of this 90 percent, at least 40 percent are using water supplies that are considered unsafe. These therefore are the population at greatest risk.

With this factor in mind we set up experimental mass inoculation campaigns in rural areas in different places throughout the Province.

Some of these were easily accessible by road, some by river in either launches or country boats, and some only by foot. All proved of value and brought many facts to light which will prove of value in future mass inoculation.

**Mass cholera inoculation, Debidwar Union, Debidwar Thana, Tippera District, East Pakistan**

Village	Population	Inoculations					Inoculation time (hours)	Approximate travel time (hours)
		Men	Women	Children	Total	Percent		
Bhoshna.....	520	104	115	159	378	73	2½	1½
Champanagar.....	510	82	59	150	291	57	1	1
Chhota Alampur.....	660	57	35	85	177	27	1	1
Debidwar.....	2,020	978	75	193	1,246	62	3	1½
Binaypar.....	300	23	49	60	132	44	1	1
Noma Bara.....	300	43	41	73	157	52	1	1
Balibari.....	500	59	72	146	277	55	1	1
Bara Alampur.....	1,200	126	61	237	424	35	2	1
Kanibil and Biniapara.....	620	223	154	209	586	95	2	1½
Marichakandi.....	980	127	144	228	499	51	1½	1
Bhinglabari.....	1,000	58	97	166	321	32	1	¾
Fatehabad.....	1,200	172	218	349	739	62	2	1½
Shailchar.....	360	40	37	57	134	37	½	¾
Total.....	10,170	2,092	1,157	2,112	5,361	52.7	19½	13

One campaign typical of rural East Pakistan from the standpoint of type of area, concentration of population, and transportation facilities was in Debidwar Thana, Tippera District. This was an area of average-sized villages accessible only by foot. From this thana we selected one union, a political land unit of from 8,000 to 12,000 population, and inoculated on a village-to-village basis throughout the area. The villagers were informed of the expected time of our arrival by the chowkidars, village officials who serve as registrars, night guards, and tax collectors, and the arrangements and selection of sites were left in the hands of the village leaders. The table shows the results of this controlled experiment. As previously stated, this area was typical as to terrain and people, and the results obtained were about the same as in other areas throughout the Province.

Many conclusions are apparent from this table and many more from observation during the inoculation periods. The total time consumed in this operation was approximately 32½ hours, or about four average working days. As only one machine was used in the operation, the average rate of inoculation was 1,340 per day per machine. Inoculators who had previously worked in this area reported the maximum number that could be done by one man with syringe and needle would be 100. So, despite the fact that these figures are small compared with those of urban areas, the injector was still doing the work of 13 men.

#### Discussion

The data clearly indicate a great variation in the percentages of persons inoculated in different villages, ranging from 27 percent to 95 percent. This could be traced to many different causes. In Chhota Alampur, Bara Alampur, and Shailchar, no previous notice had been given by the chowkidars. Because of this, many of the people were away from the village and working in the fields at the time of our arrival. In Bhinglabari, a village which is spread out over a wide area, it was raining hard during the time of inoculation and the villagers had great difficulty in reaching the site. Thus, in the four villages with the lowest percentages of inoculations, the poor showing could be traced to lack of notification,

which can be remedied, and to weather, an unavoidable factor.

The cooperation and interest of the village leaders was another element which greatly influenced the success of the program in each village. In the combined villages of Kanibil and Biniapara, the leader was an energetic person who so fully believed in the program that he went personally from house to house through both villages before our arrival and urged the people to come forward. His efforts were rewarded by the inoculation of 95 percent of the population of these two villages. The percentage of inoculation in the other villages seemed to vary proportionately with the interest and efforts of the leaders.

This again is a controllable factor. If these leaders can be called together before a program and fully educated as to the need for inoculation, the success of the campaign will be assured. As these leaders are usually older, highly respected persons, the people of their villages in most cases will follow their advice without serious question. Although total education of all the people in this respect would be the ideal, we can still accomplish our purpose by reaching this small influential group.

As the purdah system is more strictly observed in villages than in the cities, we were concerned whether the women would come forward to be inoculated. In view of this, the selection of the site of inoculation in the villages was of primary importance. We tried to select locations where the women would be protected from the eyes of men by a bamboo matting or screen as they approached to be inoculated. We found that, although they would not present themselves where men were gathered, they apparently had no objections to being seen by the person giving the inoculations, accepting him as a professional person. In most of the villages, there was no great difference in the numbers of men and women inoculated.

The one exception to this was in Debidwar, where the site selected by the officials was on the police station grounds in the center of a large open area. There was no way in which the women could approach with protection from the eyes of the many men gathered there.

Consequently few women came forward. This indicated that the site for inoculations must be selected with careful consideration of local customs.

We feel that the experiment was reasonably successful, since 52.7 percent of the population of the entire union were inoculated. We think, however, that the program could have been even more successful. Most of the factors that accounted for the low percentage of persons inoculated are remediable.

The experience at Debidwar is a fairly accurate picture of inoculations in rural areas. Some earlier campaigns were not so successful and a few later ones, through experience, were more successful. In these experimental mass inoculations extending over a period of 9 months, we have learned how to organize a program for the effective use of the jet injector in all sorts of difficult situations. We feel strongly, therefore, that these machines can be used effectively not only in fighting cholera here in East Pakistan but in the prevention of disease in any situation which calls for mass inoculation.

The utility of the injectors having been established, classes have recently been started training sanitary inspectors and doctors, not only in the operation of the machines but also in the complete repair and maintenance of them. It cannot be overemphasized that because of the intricate nature of the injector and inevitable breakdowns during field operations, the operator should not only be a competent inoculator but also a skilled technician.

Plans are presently underway to supply injectors in sufficient numbers to enable the men who are being trained to take over the major burden of mass inoculation in East Pakistan. When these plans have been realized, we will find a new horizon in the field of mass inoculation which may in time aid in the elimination of epidemics.

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### Monthly ICRS Medical Reports

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# Hospitalization Experience of the Indigent in New Jersey

SAM SHAPIRO and VIRGINIA V. VAHEY

IN 1958, the New Jersey State Legislature authorized the establishment of a temporary commission to study and make recommendations on the administration of public medical care in the State. This action became necessary because of the problems that had arisen from the diversity and complexity of the many methods and agencies being used to provide medical care for public assistance recipients and other persons unable to meet the cost of medical care out of their own income and resources.

The financing of hospital care for these persons presents the most difficulties. Hospitals receive public funds in New Jersey for the care of public assistance patients and the medically indigent primarily through lump-sum appropriations of the many municipal or county governments. Under this system, payment is often not based on the amount of care given or on the per diem cost of providing care. As a result, the greatest problem the voluntary hospitals in New Jersey face, according to the representatives of the New Jersey Hospital Association, is the strain on the hospital's financial stability caused by care provided the indigent.

The alternative to the present complex system of appropriations and expenditures viewed favorably (and subsequently recommended) by the New Jersey Commission to Study the

Administration of Public Medical Care was the payment of hospitals "on a per diem basis, the costs of which are determined on the basis of a sound reimbursable cost formula." An essential element in considering costs under this type of payment was the hospitalization experience of the public assistance recipients and the medically indigent in the various counties of the State. A full picture of this experience, however, could not be obtained from existing records or reports. Admission records in many hospitals do not identify the individual's public assistance status or indicate whether he is medically indigent. In view of this situation, the commission, in cooperation with the New Jersey Hospital Association, conducted a survey to obtain the basic data needed to project costs (1).

## General Hospitals in New Jersey

There are 152 hospitals in the State covering a wide range of functions and under varied types of governmental and nongovernmental control. The commission's interest was confined to the 86 short-stay general and maternity hospitals in the State; 82 are voluntary hospitals operated on a nonprofit basis, and the remaining 4 are city or county hospitals. In addition, there are nursing homes which take care of their residents' illnesses, specialty hospitals, Federal institutions, such as veterans hospitals, State hospitals, and public medical institutions which include medical sections of county or city infirmaries operated for chronically ill persons whose stay generally extends over long periods of time.

In 1958, there were about 610,000 admissions

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to short-term hospitals in New Jersey. This represented an admission rate of 106 per 1,000 population in the State, lower than the national average of 125 per 1,000 persons (2). (New Jersey's rate may be comparatively low because some State residents enter hospitals in neighboring New York and Pennsylvania.) From the study, it appears that almost seven out of eight of the admissions are semiprivate and private; the rest are general service ward admissions. In many hospitals semiprivate and general service ward patients have similar facilities; the only difference between them is that the former have private physicians, and the latter receive free medical care from staff physicians while in the hospital.

### Scope of Survey

In the survey special forms were mailed to short-term general hospitals in New Jersey with the request that a form be filled out for each person admitted as a general service ward case (a patient who did not have a private physician in attendance) during the 5-week period March 15-April 18, 1959. The pay status of the patient at time of admission was called for on the form for the purpose of distinguishing the following three categories of patients:

- Those paying in whole or in part for their bed care, either through hospital insurance or their own resources.
- Those receiving public assistance and the specific type of assistance program.
- Those considered medically indigent by the hospital and not in receipt of public assistance.

No attempt was made to define "medical indigency" since criteria for medical indigency were still to be established. A special inquiry to the hospitals revealed that the definition of medical indigency varied greatly from one hospital to another. A number of the hospitals base their decisions on detailed financial statements, others on the recommendation of the physician. Accordingly, statistics on the "medically indigent" developed through this survey refer to this category of patients as the hospitals defined it administratively early in 1959.

Also recorded on the survey form at time of admission were the patient's age, sex, and the

municipality where he was living. Later all forms were returned to the hospitals for dates of discharge and any change in pay status of the patient. It was anticipated that an appreciable number of the patients who were admitted as general service ward cases with the expectation of payment being made by them or by hospital insurance would become "free patients" before their discharge from the hospital. This did occur, but in the overwhelming majority of the cases their free pay status was retroactive to the date of admission.

Patients admitted as semiprivate or private cases and subsequently transferred to a general service ward were omitted from the survey. A telephone inquiry to six widely scattered hospitals showed that there were extremely few such patients and their exclusion would have little effect on any estimates of hospital usage by the medically indigent.

Sixty-two of the 86 short-stay hospitals in the State provided data for the study period. Four other hospitals stated they had no general service ward cases. The remaining 20 accounted for an estimated 5-6 percent of the total general service ward admissions in the State in 1958. No adjustments have been made for this percentage in the statistical results of the survey.

### Results of the Survey

#### *Hospital Admissions and Rates*

The 5-week study conducted by the commission indicated that, during the course of the year, there are about 79,500 admissions of general service ward patients in New Jersey. Payment is made by Blue Cross and other insurance companies for 11,000, or 14 percent, of all general service ward cases. Another 27 percent are patients who pay all or part of their hospital bed care through their own resources or for whom payment is made by relatives. The remainder fall into one of two general categories, public assistance cases or medically indigent. The balance of this report is concerned with these two groups.

Based on the information obtained from the general hospitals, it is estimated that there are approximately 12,640 admissions of persons on public assistance in a year (table 1). About

**Table 1. Annual numbers, rates, and duration of stay of general service ward admissions in New Jersey hospitals, public assistance recipients and the medically indigent**

Pay status on admission	Number of admissions	Admissions per 1,000 persons receiving assistance	Average duration of stay (days)	Total days in hospital	Days per person receiving assistance
Public assistance.....	12,640	122	11.7	148,460	1.4
Categorical assistance.....	5,600	92	12.4	69,240	1.1
Old age assistance.....	2,240	<sup>1</sup> 117	18.6	41,670	2.2
Disability assistance.....	770	129	12.8	9,880	1.7
Aid to dependent children.....	2,530	73	6.8	17,110	.5
Aid to blind.....	60	( <sup>2</sup> )	( <sup>2</sup> )	580	( <sup>2</sup> )
General assistance.....	7,040	164	11.3	79,220	1.8
Crippled children and rehabilitation.....	340	( <sup>3</sup> )	16.8	5,710	( <sup>3</sup> )
Medically indigent.....	32,080	-----	11.0	352,490	-----

<sup>1</sup> Exclusion of persons on OAA rolls who are in nursing homes and public medical institutions from the total number of OAA recipients raises the hospitalization rate to 142 per 1,000.

<sup>2</sup> Not computed, too few cases in 5 weeks' sample.

<sup>3</sup> Enrollment data for crippled children program not available for computation of rates.

NOTE: Annual figures in all tables based on 5-week survey (Mar. 15-Apr. 18, 1959) of admissions to short-term general hospitals in New Jersey.

half of these patients come from the general assistance rolls, and all but a small proportion of the others are on old-age assistance or aid to dependent children. This situation reflects, of course, the fact that the three programs, General Assistance, OAA, and ADC, account for over 95 percent of all the persons receiving some form of public assistance.

When placed on a rate basis, the general assistance and disability assistance programs have the highest hospitalization rates (164 and 129 per 1,000 recipients, respectively). The relatively high rate for persons on disability assistance is understandable in view of the nature of the program, while the comparatively high figure for general assistance is undoubtedly a reflection of the fact that ill health and indigency are often interrelated.

The lowest rate in the public assistance program in New Jersey is found among persons receiving ADC. In part, this is attributable to the special age composition of the group; that is, it is heavily weighted with children. (Because of the small number of cases, rates for aid to blind could not be calculated.)

Contrary to what may have been expected, the rate for OAA is not very high. This, however, requires some explanation. A large proportion (18 percent) of those on OAA rolls are in nursing homes and public medical institutions and are not available for admission to

general hospitals in the usual way. Exclusion of these persons from the number of OAA recipients increases the rate from 117 to 142 per 1,000, which is close to the highest, the rate for general assistance.

Important as the number of public assistance cases are to the hospitals in providing general service ward care, the medically indigent represent a far more significant group. The 5-week survey showed that in New Jersey, the volume of admissions of medically indigent is two to three times that of persons on the public assistance rolls. On an annual basis, there are an estimated 32,080 admissions of medically indigent persons as compared with 12,640 for all public assistance programs combined.

A sizable segment of the hospitalizations of the medically indigent and those on public assistance is accounted for by the aged. About a fourth of the admissions in the latter group involve persons 65 years of age or older (table 2). In view of the inclusion of OAA in this category, this high a proportion is understandable. With regard to the medically indigent, the proportion is not much less. The aged account for almost a fifth of the hospitalizations, although only 10 percent of the total population in the State are 65 or older. The discrepancy is due to some extent, of course, to higher hospitalization rates among the aged



**Table 2. Percent of general service ward care in New Jersey hospitals accounted for by persons 65 years or older, public assistance recipients and the medically indigent**

Pay status on admission	Percent of admissions accounted for by those 65 or older	Percent of days accounted for by those 65 or older
Public assistance.....	22.8	34.3
Categorical assistance..	38.1	58.2
General assistance.....	8.7	13.5
Medically indigent.....	19.3	28.7

<sup>1</sup> Virtually all of the aged are OAA recipients.

NOTE: Data for the country as a whole show that 10.4 percent of all patients discharged from short-term general hospitals were 65 years of age or older; these patients accounted for 18.0 percent of all hospital days. Part of the difference between these figures and New Jersey's is due to the exclusion from national data of hospital care for persons who died during the year.

SOURCE: U.S. Public Health Service: Health statistics from the U.S. National Health Survey. Hospitalization: patients discharged from short-stay hospitals, United States, July 1957-June 1958. PHS Pub. No. 584-B7. Washington, D.C., U.S. Government Printing Office, 1958, 40 pages.

than in the population generally. Another important factor is unquestionably the existence of lower incomes among the aged combined with less extensive coverage by Blue Cross and other types of health insurance in this group.

### *Days in Hospital*

In addition to volume of admissions and rates per 1,000 persons receiving aid, another element that must be considered is the duration of stay per hospitalization. Table 1 shows that the average length of stay is high in all groups, including the medically indigent, except ADC. In the general population in New Jersey, the average is far lower, about 8.2 days per admission to short-term general and other special hospitals (2). The reasons for the difference are not clear, but age differentials alone probably do not explain it. More significant may be the greater prevalence of serious illnesses among the indigent and possibly a pattern of use of hospitals that results in more long-term stays.

This conjecture is supported by the data in table 3 which gives the proportion of patients that stay in the hospital for specified periods of time. While the figures may not appear un-

usually high for the aged (OAA recipients), the fact that large percentages of general assistance and medically indigent patients were in the hospital for 25 or more days, for example, suggests that an intensive study of the length of stay in hospitals of indigent patients would be profitable.

The most important single measure of hospital utilization for estimating costs of a program is the aggregate number of days in the hospital. It is clear that when approached from this standpoint, many of the relationships previously taken up are not changed appreciably (table 1). The medically indigent account for considerably more hospital days than persons on all public assistance rolls combined. Projections of the 5 weeks' study data to a full year's experience indicate that the medically indigent in New Jersey spend about 352,490 days in the hospital during the year as general service ward cases. The corresponding figure for those on public assistance is only about two-fifths as large (148,460).

### *Local Area Data*

The number of days spent in the hospital during the year by the medically indigent and those on public assistance varied enormously

**Table 3. Percent of general service ward patients in New Jersey hospitals for specified periods of time, public assistance recipients and the medically indigent**

Pay status on admission	Percent of patients whose hospital stay is at least—			
	8 days	15 days	25 days	35 days
Public assistance <sup>1</sup> .....	42.9	23.1	11.9	6.2
Categorical assistance <sup>1</sup> ..	37.8	21.9	13.3	8.0
Old age assistance.....	65.6	42.3	27.9	16.7
Disability assistance....	47.3	28.4	16.2	9.5
Aid to dependent children.....	25.3	11.1	4.9	3.3
General assistance.....	47.7	24.2	10.6	4.6
Medically indigent.....	40.4	21.3	11.3	6.8

<sup>1</sup> Includes aid to blind not shown separately.

NOTE: Data for the country as a whole indicate that 29.4 percent of the patients discharged from short-term general hospitals stayed at least 8 days; 11.4 percent stayed at least 15 days; and 3.5 percent stayed at least 31 days.

SOURCE: See table 2.

**Table 4. Annual number of days, general service ward admissions in New Jersey hospitals, by size of community, public assistance recipients and the medically indigent**

Pay status on admission	Total State	Communities with population of—			
		Less than 10,000	10,000– 50,000	50,000– 100,000	100,000 or more
	Number of hospital days per 1,000 population per year				
Public assistance.....	25. 9	12. 4	15. 6	38. 9	52. 4
Categorical assistance.....	12. 1	7. 5	6. 8	10. 4	27. 2
General assistance.....	13. 8	4. 9	8. 8	28. 5	25. 2
Medically indigent.....	61. 1	17. 3	27. 9	32. 2	183. 6
	Estimated number of hospital days per year				
Public assistance.....	1 148, 090	19, 590	34, 570	24, 990	68, 940
Categorical assistance.....	69, 240	11, 770	15, 020	6, 700	35, 750
General assistance.....	1 78, 850	7, 820	19, 550	18, 290	33, 190
Medically indigent.....	1 350, 830	27, 340	61, 720	20, 620	241, 150

<sup>1</sup> These totals differ slightly from those in table 1 because they exclude a small number of persons who stated at time of admission that they lived outside the State.

among the counties and communities. Part of this variation is due to the large differences in total population of these units, but even when examined on a rate basis major differentials still exist. In general, areas where population and industry are concentrated have the highest rates. This shows up clearly when communities of the same general size are combined. In cities of 100,000 population the medically indigent and categorical assistance recipients have a far larger number of hospital days per 1,000 total persons than is the case in smaller size communities (table 4). The situation is especially marked in the medically indigent group, with 184 days care per 1,000 population in the large cities as compared with a rate of 32 in cities of 50,000 to 100,000. In the category of general assistance there is little difference between the rates for large and moderate size communities (25 and 29 per 1,000 population, respectively). The big drop occurs when the community size falls below 50,000.

#### Summary

In considering the possibility of per diem payments for hospital care of the indigent and medically indigent in New Jersey, a 5-week survey of the general short-term hospitals was conducted. Extrapolations of the survey findings

indicated that the annual volume of admissions as general service ward cases of the medically indigent was two to three times that of all public assistance recipients. Highest admission rates per 1,000 persons receiving public assistance were found in the general assistance (164) and the disability assistance (129) categories. Persons 65 years of age or older accounted for about one-fourth of the 12,640 admissions of public assistance recipients and one-fifth of the 32,080 admissions of the medically indigent.

For both public assistance recipients and the medically indigent, the average length of hospital stay was about 11 days, and almost 12 percent of both groups stayed in the hospital for at least 25 days. Hospital utilization by the medically indigent and public assistance recipients increased with size of community. In cities of 100,000 or more persons, the medically indigent accounted for a particularly large number of days in the hospital (184 per 1,000 total population).

#### TECHNICAL NOTES

All numbers and rates of hospitalization derived from the 5-week survey (March 15–April 18, 1959) are on an annual basis. This was accomplished by multiplying the survey data by the factor 52/5. A special inquiry to the hospitals indicated that in 1958, 18.9 percent of the total number of all admissions (private,

semiprivate, and general service ward combined) took place in the 2 months, March and April, making these months higher than average. (The expected proportion for these 2 months, if there were no seasonality, is 16.7 percent.) However, no adjustment has been made in this study for seasonality since it is not known whether general service ward admissions follow the same pattern as total hospitalizations. From the age distribution of patients, it would appear that general service ward patients are more heavily weighted with older persons and far less heavily weighted with children than the total admission group. This could very well affect the seasonality picture.

The hospitalization rates presented are extrapolations of survey data which refer to the situation that existed in the general hospitals that reported during the study period.

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## Retirement at 65?

In our society we accept quite as a matter of fact today that retirement begins at age 65. There was a day when some thought life began at 40. Today we have reached a point where many people at 40 are told that to start a second career is foolhardy and impossible. But while we go along accepting age 65 as a magic age for retirement, great advances in medical science and research are gradually increasing the lifespan. It is not unreasonable to assume that in the not too far distant future we will be talking in terms of 100 years for a lifespan. It is also reasonable to assume that people will be in good health and quick of mind far beyond the age of 65, as of course a great many are today.

As the lifespan goes further toward the century mark, can we sit idly by and hold to the present concept of retirement at age 65? I think not.

One researcher recently came up with this analysis. Suppose a worker retires at age 60 and lives to age 70. He has a gift of 31,000 hours of free time which would otherwise be spent at work. If you add to this the hours of free time which we all enjoy on weekends and evenings, his total hours of free time rise to 45,000 hours. This is a quantity of time which is more than all of his previous working hours from the age of 40 to 60. His free time in retirement equals precisely half of his past working life.

In a very real sense this also represents a waste of manpower, talent, energy, wisdom, and intelligence. Sooner or later we as a society must ask

ourselves if we as a Nation can afford this waste.

The Congress, in enacting the legislation calling for the White House Conference on Aging, addressed itself to this question when it stated:

"Outmoded practices in the employment and compulsory premature retirement of middle aged and older persons are depriving the economy of their much needed experience, skill, and energy and simultaneously are depriving many middle aged and older persons of opportunity for gainful employment and an adequate standard of living."

The Federal Council on Aging said in its report to the President dated September 30, 1959:

"A broad-gauged study of compulsory retirement is needed. Retirement practices which force the separation of employees at an arbitrary age level ignore the fact that different individuals of the same age have different capacities and desires. The feasibility of flexible retirement programs needs to be examined."

It might be well for us to recall that Goethe completed *Faust* at 83; Ben Franklin invented bifocals at 78 because he wanted to continue his contribution to his Nation and the world; Helen Keller at 79 is still working for the deaf and blind; Albert Schweitzer is a young 84 now. How do you really feel about retirement at 65?—ROBERT A. FORSYTHE, Assistant Secretary of Health, Education, and Welfare, in a speech delivered at the annual meeting of the Life Insurance Advertisers Association (Eastern Section) in Washington, D.C., March 17, 1960.

# Public Welfare Medical Care

LUCILLE M. SMITH

**T**HE NEW JERSEY COMMISSION to Study the Administration of Public Medical Care, created in 1956, has completed and published its report (1). The commission has invited me to present a backdrop for a discussion of its report.

Let me begin by presenting some facts for the Nation as a whole. In March 1959, payments made to suppliers for medical service for recipients of all five categories of public assistance amounted to approximately \$37 million, representing an annual rate of about \$446 million (2). The number of persons receiving assistance in that month was 6.3 million.

Of these payments, 53 percent were made in behalf of old-age assistance recipients. In the four federally aided categories, additional amounts were provided in some States in the form of money payments to enable recipients to purchase medical care, probably more than \$100 million during the year.

Let us, for purposes of perspective, contrast these figures with those revealed in the first national study of welfare medical programs in 1934 under the Federal Emergency Relief Administration (3). In March and April of that year, 17 million persons were "on relief." Expenditures for medical care were \$1,700,000, or 10 cents per person per month. This amount represented from 2.5 to 3.7 percent of all expenditures for relief. In March 1959 the monthly per capita figure was \$5.93 and medical expenditures represented 12 percent of all assistance costs.

## Increase in Complexity

These figures reflect not only the general increase in medical care costs but a complex of factors: more use of hospital and nursing home

care today than 25 years ago, more older people in the population, more disabled persons surviving to require long-term care, improved quality of care, and wider recognition of the importance of health services. To fully understand what the commission expects of welfare departments requires recognition of these changes and of experiments and emerging trends in new ways to organize health services.

New Jersey was 1 of 26 States which had a successful program under the Federal Emergency Relief Administration. It was statewide except for Hudson County, which provided care through its public hospital and outpatient department. The New Jersey program had a professional advisory committee, a full-time medical director who served without compensation, and detailed policies and procedures, including fee schedules. Although Federal funds were not then available for hospitalization, New Jersey, like six other States, met these costs from State or local funds.

In a sense, those of us who knew the Federal Emergency Relief Administration feel a nostalgia for the days when there were no categories, no complicated eligibility conditions, and there was only one public welfare medical care program. Although we can't turn the clock back, that early experience confirms the soundness of many of the commission's conclusions and recommendations which are consistent with that successful experience.

It is an understatement to say it will be more

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*Mrs. Smith is chief of the Health Services Organization Branch, Division of Public Health Methods, Public Health Service. The paper presents the substance of a speech delivered by Mrs. Smith during the 58th annual conference of the New Jersey Welfare Council, November 18, 1959, in Atlantic City, N.J.*

difficult to have a successful medical care program in 1960 than it was in 1934. But having been successful once, I am sure New Jersey will be again.

### **Patterns of Administration**

To return to the present era, let us examine the variety of ways in which public welfare medical programs are administered. As of the most recent count, 38 States make vendor payments for some medical care services.

The variation in scope of services ranges from a comprehensive program covering preventive, palliative, and restorative services of all kinds to a program which only purchases drugs. In a sense, therefore, it is a fiction to say that 38 States have a medical care program. Without sufficient scope in the services included, quality of care is not available.

In two States, Hawaii and Maryland, the public health department acts as agent for the State public welfare department. In one State, the department purchases services by contract with the Blue Cross organization which receives and pays bills for certain services on a cost-plus basis in old-age assistance. In the same State, in aid to dependent children and aid to the blind programs, recipients are given Blue Cross and Blue Shield coverage on a pre-paid insurance basis. In another State, the State medical society administers the program for the welfare department. In still another, the State pharmaceutical association acts as agent of the welfare department for the purchase of drugs, and the agency itself purchases all other services. In another State, the physicians' services organization has contracted to administer the plan for the State public welfare department. Thus a few States have moved to transfer partial responsibility for medical assistance to official or nonofficial agencies concerned with the purchase of medical care. The bulk of the public welfare agencies, however, are administering the program themselves, often with little relationship to other agencies which also carry medical care responsibilities.

### **A Series of Paradoxes**

This is one of the many paradoxes in public welfare today. Let's look at some of them.

"Do-it-yourself" has become a popular slogan in recent years for homeowners, but for public welfare administrators it is a dangerous practice. The State medical and dental societies, the State health department, the hospital association, and other health-oriented organizations have a vital role to play in the public welfare medical care program in every State.

Another paradox is the physicians' role in public assistance.

In view of the comprehensive nature of many medical care plans and of the vast sums expended, it has always seemed to me ironical that few States employ medical directors. In addition to the 2 health officers who direct the medical assistance program, only 11 States employ physicians to administer the medical care program. And this in agencies which employ a supervisory ophthalmologist to determine blindness and physiatrists and internists to determine disability! Moreover, I am told, that in many States the excellent diagnostic information secured to determine eligibility is put to no further use. Medical services purchased are usually remedial—rarely are preventive or restorative services purchased. Thus, we are increasing the number of disabled who will continue to require large sums for their support, including their medical care.

Fortunately, some communities have begun to look for ways in which early diagnosis and treatment services can prevent disabling illness, and at other projects designed to restore the disabled to self-care. Hopefully, the 1956 amendments to the Social Security Act, stressing self-help and self-care, will motivate many agencies to undertake such projects. Let me give you a few examples of demonstrations in California and New Jersey that have proved most successful.

In Santa Cruz County, Calif., the local health department offers a physical screening and treatment program to all old-age assistance recipients who wish to enroll in the program. Costs are met through a combination of ingenious financial arrangements. The welfare department considers the physical screening phase a part of its determination of need and for this reimburses the health department from its administrative fund, thus securing half the cost from Federal funds. The State's medical care

program meets the costs of home and office visits and some drugs. Surgery, drugs not provided through the State program, and dental and ancillary services are financed by local health department funds. This program which has been operating since September 1955 has served 1,501 recipients or nearly one-half the total old-age assistance caseload in the county. Three clinic sessions are held weekly. A distinguished retired physician who serves without compensation conducts the history and physical examination. A public health dentist, public health nurse, and social worker are provided by the health department.

In a paper recently presented to the State directors of chronic disease programs, Dr. Russell S. Ferguson, health officer of Santa Cruz County, described the program in detail pointing out the financial savings as well as the better health which resulted from prompt identification of medical need and a team approach to developing a treatment plan. He concludes that important results have been achieved through this project:

"First, an increased interest by the individual with respect to the future maintenance of his own health achieved by the screening examination and the immediate reference to the physician of his choice. Second, through our mobilization of every financial and community resource we have been able to provide the vendor of medical, dental, and ancillary services and the recipient with means whereby the latter's health may be maintained. Third, we have been able to restore these people to the dignity of private patients in private hospitals for surgical care resulting in impressive savings to the county and restoring to the surgeon his privileged relationship with the patient. Finally, we are convinced that these services can be provided at exceedingly low cost and do contribute to the prevention of long-term illness involving institutional care and the prevention of blindness" (4).

Within New Jersey, following the mandate of the Prevention of Chronic Illness Act, a project was designed in 1955 to make restorative services available to selected persons receiving public assistance. Many of you probably know of the restorative services unit of the Essex County Hospital in Belleville. It was financed

by a combination of State health and county welfare funds and with joint planning by official bodies, seven community hospitals, and the Essex County Medical Society. The focus of this project was on restoration of chronically ill and aged individuals to self-care.

Many of the patients had a long history of hospitalization and most were bedfast or chairborne. Of the 188 admissions to the project, 143 outlived the study period. Of these, 75 percent were bedfast on admission, but only 3 percent were bedfast on discharge. The study documents the savings in dollars, in use of expensive medical facilities, and last but not least in human dignity and self-sufficiency. A report of the study presented before the 1958 annual meeting of the American Public Health Association was prepared by Adriane V. Duffy in collaboration with Marguerite F. Hall. Following the pattern established at Essex County Hospital, this type of professional, technical, and financial assistance is being extended by the State health department to other community hospitals in order that restorative services may be provided as soon as possible after the onset of illness. Such measures are designed to prevent disabling impairments and to minimize the disruption of family life.

Both of the projects described illustrate new trends in public health administration that should be of as much interest to welfare departments as are the recent amendments to the public assistance titles of the Social Security Act concerning matching of expenditures for medical care. The latter made more Federal money available to State agencies and also made possible simplifications in the purchase of medical services for public assistance recipients. They did not—and were not devised—to assure the availability of the highly specialized preventive and restorative services needed by these recipients. More and more, the role of public health departments is being shaped to include this important responsibility. The Santa Cruz and Belleville demonstrations, hopefully, will stimulate other county health and welfare departments to combine resources to get preventive health services to recipients at an early date.

New Jersey is the only State in the Union which has set out to make homemaker service

## Recommendations

The following summarizes the Report and Recommendations of the New Jersey Commission to Study the Administration of Public Medical Care. The publication is available from the New Jersey State Department of Institutions and Agencies.

*"Organized medical care in the widest sense of the word has come to be recognized as essential to the effective and economical operation of the public assistance system as well as to the welfare of needy persons. There is hardly a more fascinating chapter in the history of social organization of medical care in this country than the story of the progress from repression of pauperism to rehabilitation of the recipient of public aid; from provision of some medical treatment and minimal custodial care to that of a wide range of protective, curative and rehabilitative health services; and from reluctant acceptance of paupers to eligibility of all persons receiving basic income maintenance and increasingly of medically needy people,"* Dr. Franz Goldmann stated in his book *"Public Medical Care"* (1945).

The commission believes that it is in the spirit of this statement by Dr. Goldmann that the medical care program for all the needy of the State should be organized and administered. They believe that there is a base on which a good program can be developed but that some realignment is necessary both in administration and financing.

The commission believes the duplication of administration by multitudinous agencies should be abandoned and that the county welfare boards administering the four categories of aid could best be developed as the units to administer all the medical care programs for the needy as well as the medically indigent.

Well-organized comprehensive medical care programs require the advice and counsel of trained medical practitioners who should be assisted by the services of professional medical social workers and other consultants in the allied disciplines representing dentistry, optometry, hospital management, nursing, and others. The medical unit should have the services of technicians to implement special studies.

There should be communication with the professional organizations representing the suppliers of medical, hospital, and allied services through desig-

nated members serving on committees consulting with the professional personnel of the agency.

A comprehensive program should include the gamut of medical, hospital, and allied services any or all of which may be necessary to care for the needs of the recipients. The individual or institution providing the services should be paid directly on a fee-for-service based on a negotiated fee schedule. Hospital rates should be established on the basis of a reimbursable cost formula acceptable to the department and the hospital association.

The present lump-sum appropriation system for voluntary hospitals and nursing organizations should be abandoned as administratively unsound and economically indefensible.

Those persons who are ordinarily self-supporting, but because of illness become medically indigent, should be the responsibility of the county welfare boards on the basis of established criterion of need. This criterion should be established by the board of control of the department of institutions and agencies.

The obligation to repay the agency for medical expenditures should be established for the general assistance recipients and the medically indigent by rule of the department. This obligation should take into consideration the individual's particular circumstance and the burden of high cost medical care, particularly hospitalization.

Financing of hospital care for all those persons who are in need should be borne more equitably by the Federal, State, and county governments. The municipalities will be participating by their contributions to the county tax funds.

The commission believes that a medical care program for those in need and the medically indigent in which the executive officer, the legislature, and the people of New Jersey can take pride is the objective of this study. The program should have a sound legal base and good professional administration so that it fulfills the purpose of serving those in need in a wise and humanitarian spirit.

The success of the program will be determined by the interest and competence of those who have the responsibility for the administration of medical care for those who cannot provide it for themselves.

available to everyone who needs it, and the goal is more than half reached. Now 14 agencies offer homemaker service in 13 counties. Three other counties are working toward establishment of a program. This is another instance in which the health department has undertaken to create the availability of services and in which public welfare participates actively both in planning and in financing the service.

When communicable diseases were the major focus of public health programs, a battery of laboratory, diagnostic, and treatment services were made available to help practicing physicians give good care to their patients. So today when chronic disease is the major public health problem, health departments are developing new techniques of therapy and new methods of organizing health services so that they can offer to the practicing physician the services of public health nursing, medical social work, physical therapy, and occupational therapy which, when coordinated under the physician's direction, will bring long-term patients the kind of care that meets their needs.

### Guidelines

To help public welfare agencies arrive at some simple "do's" and "don'ts" in undertaking the very important task which is laid out by the commission's report, let me summarize a few of the "do's":

- Consolidate your local efforts into units of workable size. It is folly to think of 500 local medical plans in the State; 21 is a reasonable number.

- Appoint in each county one or more advisory committees to help develop the county adaptation that will meet the requirements of the State plan and make best use of the local resources. Choose the public-spirited leaders from medicine, dentistry, nursing, social work, and other health interests to help you. Hospital and nursing home administrators and directors of visiting nurse associations are logical candidates for membership. In my judgment, the health officer or his representative is a "must" on such a committee. To balance the health interests, it is well to include representation from industry and labor and the lay public.

- Employ a good medical director, full time wherever practical. In selecting him, do not overlook the physician who has had administrative experience in industry, in group practice, or in the military service.

- Look to the medical society for guidance. Their help is a sine qua non in designing and carrying out practical policies and procedures. At the outset take to them your little problems as well as the big ones so they can know of your failures as well as successes. This will assure that their interpretation of the program to their fellows and to the other purveyors of health services is a true reflection of what the agency means to do and why and how it does so.

- Make a plan for seeing the official publications of national agencies that can keep you abreast of developments in medical care. The journals of the American Dental Association, American Hospital Association, American Medical Association, American Nursing Home Association, American Public Health Association, and the American Public Welfare Association all carry articles of value to administrators of public welfare medical care programs. The same is true of the *Social Security Bulletin* and the Public Health Service's *Public Health Reports*. Two less technical publications which the American Medical Association publishes for free distribution have real value for you—*The AMA News* and the *Chronic Illness News Letter*. Shortly, the AMA will begin publication of a *Bulletin on Homemaker Services*.

The American Public Welfare Association has a series of publications specific to the administration of public welfare medical care programs, "The Physician in the Public Welfare Agency," "The Medical Social Worker in the Public Welfare Agency," "Self-Evaluation Schedule for Medical Assistance Programs," "Improving the Quality of Tax-Supported Medical Care," and "Medical Care in Public Welfare" (report of Institute III), to mention only a few. All of these are for sale by the association at a modest price.

- Plan for at least an annual meeting where medical directors can share their experiences. A group council such as the New Jersey Welfare Council provides a readymade vehicle for such sessions.

- Encourage your medical directors to at-



tend regional meetings of the American Public Welfare Association and the biennial round-table so they can talk with their counterparts in other States.

There are a few cautions I should like to advance in the "don't" column:

- Don't regard the medical assistance program as merely a purchase-of-service program. It is much more than that. Be concerned with health maintenance and health promotion. Give serious consideration to the evaluation of present services and redirection when indicated. Make use of diagnostic records to plan with recipients for the treatment they need.

- Don't allow the costs of hospital and nursing home care to cloud your vision. In my judgment, preoccupation with these two types of service prevails throughout the entire United States in spite of the fact that most people who are ill or disabled are at home and prefer to be cared for there. Give services for patients at home a high priority.

- Don't work in isolation. Especially learn the differences in philosophy and objective of other official agencies like the health or rehabilitation departments and develop a systematic method of cooperation with them.

- And, finally, don't be discouraged. You are on the eve of one of the most exciting tasks you will ever have. I once organized a local medical care program with the active help of all the organizations I have mentioned. It took about 9 months to develop basic policy and procedure. They were the most rewarding months of my life. I had more help from more people than in any corresponding period of my 35 years of work. I wish you the same good fortune.

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## Community Health Administration Studies

During the past several years, the W. K. Kellogg Foundation has awarded grants to three State health departments (California, Florida, and Washington) and to the schools of public health of three universities (Johns Hopkins, Michigan, and Toronto) for development of studies in community health administration. From these studies the Foundation hopes will emerge new relationships and patterns of public health practice for both the schools and the operating agencies.

Directors of the studies held their first meeting in Washington, D.C., on March 17 and 18, 1960. The meeting was sponsored by the Foundation to provide an opportunity for exchange of viewpoints and experience and to discuss common problems. H. H. Hasson, associate director of the division of medicine and public health of the Foundation, requested Dr. William F. Mayes, assistant chief, Division of General Health Services, Public Health Service, to assist him in planning the meeting and to serve as its chairman.

# Social Science in Family Medical Care

ELIOT FREIDSON, Ph.D., and GEORGE A. SILVER, M.D.

THE CHANGES taking place in medical practice all over the world are reflected both in medical knowledge and in the roles of professional workers associated with the techniques of medicine. Efforts to reconstruct a stable system of medical care appear to stem from a number of objectives.

Most people would agree that any system of medical care should first make full use of all the modern knowledge and equipment available to produce the scientifically accurate diagnosis and treatment we call good care. It should offer a worthy and dignified role as well to the professional practitioners who are to provide that care. Also, and by no means to be taken as academic, it should be so constituted that prospective patients will choose to take full advantage of the benefits offered by such care.

There is general agreement on these objectives. But a controversy hinges on the form of organization by which they may be achieved.

This report describes an experiment in medical care that sought to fulfill these objectives, some of the findings of the study of that experiment by a social scientist, and the way in which these findings may aid in reformulating the organization necessary to achieve full use of such medical care by the public.

## Family Health Maintenance Demonstration

At the Montefiore Hospital in New York City, there has been in operation since 1950 a program of comprehensive medical care on a prepayment basis for 150 families. Services are given not by individual practitioners of the various specialties, but instead by a functioning

health team composed of an internist, a pediatrician for children under 13 years of age, a public health nurse, and a social worker. This is the Family Health Maintenance Demonstration (1,2). The families were selected at random from a large group of those insured under the Health Insurance Plan of Greater New York (3). The health team gave the family a baseline examination, conferred with the family on the findings, and supplied comprehensive medical care over a 4-year period. At the end of the 4-year period, the team made a second evaluation of the family's health.

Comparable data were also obtained for a matched control group, substituting the services of individual practitioners from the Montefiore Hospital medical group for the demonstration health team. The demonstration originated within this medical setting. In essence this was a controlled experiment on the effect of an organized medical care program on health. The study families were given team-organized services while the control families continued to use the individual services of the medical staff of the Montefiore Hospital medical group, and the health of both groups was assessed in the same way at the end of the program.

Part of this experiment was designed origi-

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*Dr. Freidson is assistant professor of sociology, the City College of New York, and Dr. Silver is chief, division of social medicine, Montefiore Hospital. Dr. Silver was director and Dr. Freidson, consultant, in the Family Health Maintenance Demonstration. This paper was read at the Fourth World Congress of the International Sociological Association, Stresa, Italy, September 1959.*

nally to determine what health education and promotion techniques would influence the health of families favorably if added to health programs (1). Of course, arbitrary criteria were used to define "health education," "health," "favorable," and the like. Health, for example, was defined as capacity to function successfully in four major areas—work, sex, play, and family life. By these criteria, it was found that the program was not successful in improving the health of families. At the same time, however, team organization of medical care was successfully demonstrated and seemed highly satisfactory to the patients.

### The Role of Social Science

The social scientist could take no active or manipulative role in the demonstration. By its controlled nature, changes could not be introduced. Instead, the social scientist sought to study, in a broad, exploratory way, the relation of the organization of medical practice to the behavior of patients. Attention was concentrated on the patients' conceptions of professional practitioners and the processes by which the patients use the services. Through this study, hypotheses were developed about the conditions under which professional services could be used, based on a theoretical framework which stems from communications research and anthropological conceptions of the community.

Analysis of the findings seemed most appropriate within the context of an organized process of interpersonal influence similar to that described by Katz and Lazarsfeld (4). The process seems of particular significance when the patient is uncertain, as on occasions when he must select a new doctor, or when he uses a doctor for the first time, or when he is undergoing mild suffering from ambiguous symptoms and cannot decide how his illness should be treated or whether he should consult a professional practitioner about it. Whether or not this uncertainty occurs is, of course, largely the result of the culture or knowledge of the patient. But when it does occur, the course taken seems to be determined by the lay culture in which he lives and the network of lay and professional consultants to whom he turns for help. We have chosen to label this the "lay re-

ferral system." The lay referral system is paralleled by the professional referral system, with its own culture and network of consultants and colleagues.

### Use of Services

The primary objective of the Family Health Maintenance Demonstration was to experiment with team organization of health services (5). It became clear rather early that one member of the professional team, the social worker, was not being consulted to the degree considered appropriate by professional standards. This was not due to a lack of personal problems in which a social worker could assist, since members of about one-third of the families were recognized as having such problems. Neither was it due to the patients' failure to recognize that they had such problems, for they did seek help from other team members.

Research by intensive interview and questionnaire suggested that the role of the social worker in the team was both culturally and structurally isolated from the lay referral system (6). The patients seemed to avoid using the social worker because her professional role was segregated not only from medical problems but also from such everyday affairs as nutrition, housing, and the children's schooling. In consequence, the social worker came to be defined by the patients as a specialist rather than an everyday consultant. Functionally, a specialist is consulted only after exhausting more commonplace resources. In avoiding the social worker and seeking the aid of the public health nurse and the physician for their personal problems, the patients were in essence seeking less specialized aid.

Thus it was hypothesized that because of the cultural background of these patients, early use of the social worker as a preventive measure could be expected only if her role were changed to more closely resemble, for example, that of the public health nurse, which was more informal and more concerned, on the surface at least, with the manifest medical, economic, and interpersonal affairs of everyday life. This role was subordinate to and chronologically was used prior to that of the physician in the process of defining illness and seeking

aid, standing as it did between that of the physician and that of some such lay consultant as a relative or friend. However, if the social worker's role was not changed and if the patients' culture remained unchanged by an educational campaign, it was concluded that the social worker would be used primarily by those few who believed themselves to have exhausted "ordinary" sources of help, and thus conceded the "special" nature of their problem.

Use of the social worker reflected the organized process of seeking help stemming from the concept of the lay referral system. This was also seen to be the case in the use of medical services.

Eleven percent of the families (13 of the 117 responding) reported that some member of the family at his own expense had a surgical operation performed or a child delivered by an independently practicing physician while the family was enrolled in the demonstration and was entitled to this medical care under the terms of its subscription. For more everyday, nonsurgical services, 6 percent of 119 families indicated that some member had used the services of an independent practitioner "quite a bit," and an additional 31 percent reported that an independent practitioner was used "occasionally" at out-of-pocket expense.

But an overwhelming proportion of patients were far more satisfied with the health team organization of care than with care received from individual practitioners, either in group or independent practice. Ninety-two percent of the families responding believed that the health team demonstration was more beneficial to them than care received from the Montefiore Hospital medical group, and 85 percent concurred in approving the health team when comparing its care with that received from their prior "private doctor." Also 94 percent stated that it was more pleasant to be a Family Health Maintenance Demonstration patient than to be a Montefiore Hospital medical group patient, and 74 percent stated that it was more pleasant to be a demonstration patient than to be the patient of a "private" doctor outside either scheme.

There seems to be a contradiction in these data. If so many patients believe that the

demonstration is beneficial to their health and pleasant to use, why did one-third of them use outside services? On the whole, and we must compress a good deal of data here, two things seemed to be involved in the use of outside services—the patient's assessment of the quality of medical care available to him and his assessment of the importance of his medical complaints. In what seems to be the bulk of the instances of use of outside services, the patients assessed their complaints as minor, and assumed that for minor complaints any physician is competent. Under such circumstances, simple convenience seemed to dictate the occasional use of a neighborhood, independent physician rather than the demonstration physician at the centralized medical group. This was particularly the case for home calls at night when the demonstration physician was unavailable, and other physicians of the medical group were on call in rotation. In this situation, of course, the ability to pay the fee of the independent practitioner is an important element. It was found, in fact, that the use of outside services increases in general as social class, and its contingent ability to pay, rises.

Where just convenience is involved and the illness does not seem to be critical, typically the patient acts as an individual, without interaction with lay consultants. This is not the case in more analytically interesting instances when the patient feels some anxiety about the illness and becomes uncertain about the qualifications of the physicians involved. On these occasions, the relationship of the lay referral system to the professional referral system becomes quite important.

Analysis of instances of the use of outside service, probed during intensive interviewing, has not been completed. But at present it seems that the necessity to use a specialist rather than the everyday family health maintenance physician, whether for surgery, child delivery, or special therapy, seems to be common to all instances that do not rest on sheer convenience. These were cases where referral from the demonstration to a Montefiore medical group specialist was not sustained. And, by definition, these were cases where referral implied the illness was serious. In these cases,

nally to determine what health education and promotion techniques would influence the health of families favorably if added to health programs (1). Of course, arbitrary criteria were used to define "health education," "health," "favorable," and the like. Health, for example, was defined as capacity to function successfully in four major areas—work, sex, play, and family life. By these criteria, it was found that the program was not successful in improving the health of families. At the same time, however, team organization of medical care was successfully demonstrated and seemed highly satisfactory to the patients.

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ferral system." The lay referral system is paralleled by the professional referral system, with its own culture and network of consultants and colleagues.

### **Use of Services**

The primary objective of the Family Health Maintenance Demonstration was to experiment with team organization of health services (5). It became clear rather early that one member of the professional team, the social worker, was not being consulted to the degree considered appropriate by professional standards. This was not due to a lack of personal problems in which a social worker could assist, since members of about one-third of the families were recognized as having such problems. Neither was it due to the patients' failure to recognize that they had such problems, for they did seek help from other team members.

Research by intensive interview and questionnaire suggested that the role of the social worker in the team was both culturally and structurally isolated from the lay referral system (6). The patients seemed to avoid using the social worker because her professional role was segregated not only from medical problems but also from such everyday affairs as nutrition, housing, and the children's schooling. In consequence, the social worker came to be defined by the patients as a specialist rather than an everyday consultant. Functionally, a specialist is consulted only after exhausting more commonplace resources. In avoiding the social worker and seeking the aid of the public health nurse and the physician for their personal problems, the patients were in essence seeking less specialized aid.

Thus it was hypothesized that because of the cultural background of these patients, early use of the social worker as a preventive measure could be expected only if her role were changed to more closely resemble, for example, that of the public health nurse, which was more informal and more concerned, on the surface at least, with the manifest medical, economic, and interpersonal affairs of everyday life. This role was subordinate to and chronologically was used prior to that of the physician in the process of defining illness and seeking

fectiveness increased by adding the benefits accruing from more extensive training in case-work and psychiatry. The day-to-day team would thus be smaller, composed of two physicians (one for adults and the other for children) and the public health nurse. The social worker, however, might continue in close liaison with the team, but not on a full-time basis: she could represent the first echelon of referral for emotional difficulties in those families which recognize and accept the fact that psychiatric care is required.

Finally, it might be said that both the demonstration and the findings of the social scientist in his study of it have had important and encouraging implications for social policy. The popular fear of governmental or private large-scale medical service in the United States seems to be based on the fear of loss of personal attention in a bureaucratic setting. Team practice, as it was observed in the Family Health Maintenance Demonstration, seems to provide the attention desired, even though the setting is bureaucratic, since the patients expressed a high degree of personal satisfaction with the care they received.

A notable aspect of this satisfying team action was the family conference, an annual, hour-long discussion between parents and professional team members which seemed to allay suspicion, deflect hostility, and offer a unique opportunity for the exchange of information. If such team practice could be integrated into

the informal conferences that take place between patients and their lay advisers, it might be possible to allay even those instances of suspicion occurring when patients are referred to specialists in a bureaucratic setting.

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### Research in Health Departments

A regional conference on the opportunities for research in local and State health departments, sponsored by the Public Health Service, drew representatives from six States to Atlanta, March 14-16, 1960.

The conference included a demonstration of the operation of a study section, reviewing grants applications, with reference to specific projects or research proposals. The study section members benefited no less than the audience from the discussion. The need for communication guiding information from the National Institutes of Health to the principal investigators and applicants was emphasized repeatedly.

It was the consensus that such conferences in other regions would be helpful to health officials.

the diagnosis or the referral or both were questioned by the patients, and, in the course of seeking alternative diagnoses or of validating the competence of the specialist to whom they were referred, they were led outside the medical group.

This difficulty in professional referral seemed to stem in part from the very mode in which medical care was organized. The patients rightly viewed the Montefiore Hospital medical group in which the demonstration operates as a cooperative organization. In this sense, when their demonstration physician referred them to a medical group specialist, they believed that the referral was necessarily to the man who happened to be working in the medical group, and not necessarily (but of course possibly) to the so-called best man in the field. The patients who went outside wanted what they believed to be more disinterested validation of the quality of the physician to whom they were referred. Disinterested sources of validation, however, are also outside the professional organization of the group—"private" physicians and the lay community. In those few cases recorded where temptation to use outside services existed but was resisted, the patients happened to obtain recommendations of the group specialist to whom they had been referred from lay consultants who knew the work of the specialist or, in one case, from an independent "private" physician. The major source of such validation of professional quality appears, in fact, to lie in the lay referral system, so that we may expect those patients whose lay consultants do not know the reputation of the medical group physicians to be subjected to interpersonal forces that encourage the use of outside physicians. Some statistical evidence to support this conclusion has been gathered.

On the basis of these exploratory findings, it was hypothesized that a medical care organization has a better chance of holding its patients through all contingencies if the patients interact with each other in inclusive natural networks of interpersonal influence. Where patients are unknown to each other and yet they participate in a number of lay referral systems the bulk of whose members have no experience

with the medical organization in question, it is to be expected that use of the service will be diminished to some extent.

### Application of the Findings

As Katz and Lazarsfeld have shown (4), the concept of personal influence has relevance to sociometric and small group studies. We may add that it also underscores the relevance of comparing anthropological studies of "little communities" (7,8) with studies of urban aggregates (9). The concept of the lay referral system allows us to consider simultaneously the culture, or "health education," of the patient, his participation in a highly influential network of lay consultants, and, finally, the structured relations which exist between the lay and professional worlds. This relevance is most extensive in instances where patients have a considerable latitude of choice between practitioners, a situation characteristic of some parts of the United States but not of some other countries (10,11). It is also relevant to any medical system where the patient may at least choose not to use available medical services at all (12).

In the program described here, however, and in future plans for similar programs of research in modes of family health care, a number of implications have emerged. First of all, it may be observed that the picture of society that it gives us is one obviously incompatible with viewing the patient as an isolated individual or even as a member of an isolated nuclear family. In future experiments with the organization of medical care, it seems that we must deal with the patient as a member of a network of interpersonal influences. This means that a fruitful source of study populations may lie more in such networks than in individuals selected at random. A selection of such networks should also include the members of the network to whom others would naturally turn for medical and personal advice and guidance. After influencing these "influentials," health education may not continue to be unsuccessful in modifying behavior, and, as hypothesized, patients might be more thoroughly "held."

In a future program, it seems also that the social worker need not be used as a primary teamworker. The public health nurse's role could be exploited to greater effect and her ef-

# The Sweep and Excitement of Science

JOHN R. PLATT, Ph.D.

THE tremendous interest of the public in science today, I think, can be attributed to two main factors. One is the headline role that technology is now playing in war and in public affairs. It inspires readers to learn more, uniting their curiosity with good citizenship. But much of our fascination is also due to the skill and devotion of teachers and writers, editors, and broadcasters, who are trying to present the story of science to the mass audience and to explain in simple terms just how atomic piles, computers, and satellites work and what they mean. Interest feeds on explanations. The more we get, the more we want, from 4 years of age onward.

Science no longer needs to be explained just to laymen and citizens and children; it now needs to be explained to statesmen and philosophers and even to scientists themselves! The poor scientist can never keep up with the hundred thousand research papers that are published every year, and so he becomes a layman too, in every field but his own, and an important part of the mass audience. There will have to be writing up as well as writing down. There is a need and an audience at every level of sophistication from the nursery school to the graduate school.

What shall we give these audiences? Everyone has his own recipe, but I am sure we are all agreed today that quiz-show facts are not enough. I once heard an English chemist

criticize another English chemist by saying, "That man knows more facts that are almost right than anyone else in the world." Perhaps the American public knows more facts that are almost right than any other public in the world.

But even if the facts are right, the public needs something larger if it is to understand what science is all about. There are three particular qualities of basic science—not technology but basic science—that I think a citizen in a scientific society should be shown over and over until he begins to feel them for himself. The first quality is the excitement of science, the second is the sweep of science, and the third is the incompleteness of science.

## Excitement

To say that basic science is exciting may sound like a contradiction. We are used to the really spectacular excitements of the engineers with their radar and rockets; and the life-and-death excitements of the doctors, the biological engineers, in their white coats. By contrast, the intellectual excitement of a man sitting over a microscope in a university basement tracking down a clue may seem pretty tame. But I would remind you that there are two intellectual excitements that are not tame at all and that we remember all our lives. One is the thrill of following out a chain of reasoning for yourself; the other is the pleasure of watching several strongly individualistic personalities argue about their deepest convictions. That is to say, the thrill of a detective story and the pleasure of watching a play by George Bernard Shaw. I would claim these are exactly the excitements basic science has to offer.

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*Dr. Platt, professor of physics, University of Chicago, delivered the address from which this article was taken before the Thomas Alva Edison Foundation meeting on "The Mass Media and the Image of Science" in Washington, D.C., November 6, 1959.*



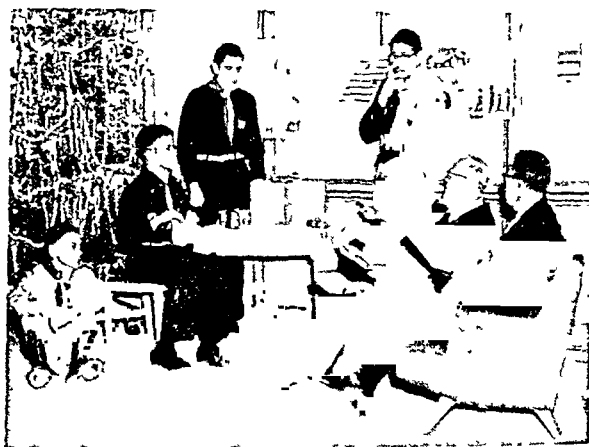
# Health Television Series in Twelfth Year

IN DECEMBER 1959. Baltimore's health information television series, "Your Family Doctor," began its 12th consecutive year. The series, commencing December 15, 1948, is not only the oldest continuously produced medical television series, but now has one of the longest consecutive runs for a television series of any type. From this, one may infer a sustained viewer interest and demand for health information through television.

On a surprisingly small budget, the Medical and Chirurgical Faculty of Maryland and the Baltimore City Health Department have presented more than 550 programs in this series. Cooperation by many interested groups has kept production costs low. Broadcast time and facilities are contributed by station WMAR-TV. Civic organizations regularly provide speakers, panel members, and actors. A Boy Scout group, *upper right*, participated in a pre-Christmas "Home Safety" show, and an American Red Cross swimming class, *center*, in an early summer "Swim Safely" program.

Health directors who contemplate producing a television series or a single program may obtain information regarding the availability of source materials from the World Health Organization, Division of Public Information, Palais des Nations, Geneva, Switzerland; from the Pan American Sanitary Bureau, 1501 New Hampshire Avenue NW., Washington 6, D.C.; from the Public Inquiries Branch, Public Health Service, Washington 25, D.C.; or from the Bureau of Health Education, American Medical Association, 535 North Dearborn Street, Chicago, Ill. Sample scripts used in the Baltimore series may be obtained by writing to Dr. Huntington Williams, Commissioner of Health, Baltimore City Health Department, Baltimore 3, Md.

*Portion of a script used in Baltimore series.*



about this distressing situation? Now  
CUT TO M.C.  
H.C.  
JOP #1 ANCH Your Family Doctor and your City Health Department  
are waging an unceasing war to protect the health of you,  
the people of this community. (PAUSE) That you may live  
a healthier, fuller life,  
BALOP #2 The Medical and Chirurgical Faculty of Maryland and  
BALOP #3 The Baltimore City Health Department  
BALOP #4 present  
BALOP #5 Your Family Doctor in  
BALOP #6 "A Future for Five Million"  
CUT TO STUDIO  
TO STUDIO  
QUESTIONS WORTH Good afternoon, I'm Dr. Worthington and my  
...my are Mr. and Mrs. Philander Kiss

ple who get paid for doing exactly what they like are physicists and baseball players. When the word leaks out to the children, there will not be laboratories enough to hold the budding scientists.

### Sweep

The second quality to get across to the mass audience is the scope or sweep of science. By this I mean the great range of problems covered, the range of the methods of work, and the wide range of the implications. For illustration I have selected three areas which show very different patterns of development today. One of these is biophysics, the second is what is called molecular biology, and the third is some of the recent work on evolution.

Biophysics is one of the border areas of physics. It is one of the active fronts that have radiated out from the atomic physics of 30 years ago. In one direction these fronts include the new and rich and spectacular sciences of space physics, nuclear physics, and solid state physics. In the other direction, the activity runs instead along several of the borderlines with the older disciplines, giving us the somewhat quieter fields of chemical physics, biophysics, and psychophysics, all of them largely confined to the university laboratories.

These latter areas are not sharply separated. I myself started out in chemical physics, studying the light absorption of dyes and similar molecules. I found that this led me to a study of chlorophyll which was a biological molecule and therefore biophysics. And then it led me to a study of the visual pigments of the human eye, which are the first elements struck by light in the psychological act of vision, and therefore psychophysics.

Biophysics proper is not what I call an exploding field at present but one that is just simmering along nicely. An important area of study lately has been the transfer of light energy between neighboring biological molecules. Many workers feel that such a transfer might be the first step in vision and the first step in photosynthesis, as well as the first step in the damaging of tissue cells by nuclear radiation. This makes it a hot subject and numerous international conferences on it are being held.

My only regret is that some people have chosen to call the subject "bioenergetics," which makes it sound more like a branch of naturopathy than a field of science.

Although the subject of energy transfer is of wide interest, the actual results are rather tenuous, partly because the experimental work has to be exceedingly painstaking. During a summing up session at the Brookhaven conference on this subject recently, the participants listed roughly a dozen new physical instruments and tools that they wished could be invented in order to facilitate work in this field. For example, methods are needed that would permit us to observe or infer the first chemical reaction steps of many biologically important molecules, including the primary molecules in vision, in photochemistry, in genetics, and the antibodies. Conceivably such methods of observation will evolve out of the fluorescence-interaction methods of Michael Kasha, or the tracer technique of Melvin Calvin, or the recent ingenious substitution technique of Engleberger and the Koshlands, or out of a completely new approach. The question remains open. Work is in progress.

Biophysics merges into a closely related area that today is anything but placid, the area of molecular biology. It has had an explosive development in the last 10 years. It was notable first for the numbers of physicists, chemists, and doctors attracted into it by such inspiring microbiologists as Salvador Luria and Max Delbrück. Now it is the scene of the last two Nobel Prizes in medicine, the one to Joshua Lederberg, George Beadle, and Edward Tatum, and one to Severo Ochoa and Arthur Kornberg. And sitting at conferences, one watches with pleasure and astonishment the beautiful demonstrations of the other theorists and experimenters, wondering which of them will be next to get the prize.

Will it be James Watson and F. H. C. Crick, with their two-strand model of the DNA molecule so thoroughly proved in the last few years? Will it be Meselson and Stahl, or Taylor, Woods, and Hughes, with their beautiful tracer methods of testing the model? Will it be Seymour Benzer, with his analysis of microgenetic characters a thousand times finer than any ever

Moreover these intellectual thrills in science are not something distant or alien, but something closely continuous with our everyday thinking. It is true that science is complex. This is because so many men have been building it up for so long. Nevertheless every individual step in it is a little inference as simple as looking out at the weather and deciding whether or not to take a raincoat. When we look at a celebrated rocket engineer like Werner von Braun, we see a man running a big complex organization and dealing with incredible horsepower. But when we look at a fundamental scientist like James Van Allen, the university professor whose tiny satellite equipment detected the radiation belts around the earth, fundamentally what we see is a man stepping to the door of his planet to see how the temperature is outside.

What is essential in any science story is the little chain of everyday inference, the reasoning. It may surprise many people to know that the chain of new scientific reasoning in a whole research study is frequently less complex than an everyday business decision or a crossword puzzle or a game of chess. It would have a salutary effect on our attitudes if for 24 hours we could cross out the words "science" and "scientist" wherever they appear, and put in their place the words "man reasoning." Even in the mathematical sciences, like physics, it is the reasoning that comes first, the equations second; and the equations will not save the theory if the reasoning is wrong. It cannot be said too often that science is not mathematics, but reasoning; not equipment, but inquiry.

The master at demonstrating reasoning to a mass audience was Conan Doyle. It would not be far wrong to think of every science story as his kind of detective story, with its puzzles and its suspense, its false leads and frayed tempers, and its brilliant Sherlock Holmeses, its half-brilliant Inspector Lestrades, and its admiring Doctor Watsons. It is interesting to remember that Galileo himself used a very similar group of characters to explain his reasoning to a mass audience. Science is the greatest of all detective stories, a continued yarn that holds its audience for life, with the disagreements of the characters

nowadays just as conspicuous and as amusing as ever.

The second excitement in the science story is the excitement of personalities. Biography and belles-lettres have hardly touched the field of science. There is valuable literary work to be done here. We need a good biography of G. N. Lewis, whose department at Berkeley turned out half of the best physical chemists in America. We need one of William Moffitt, the witty and brilliant theoretical chemist at Harvard, whose death last year at 33 was a loss far greater than the loss of any headlined baseball player or movie star. We need to put our senior teachers, James Franck of Chicago and Joel Hildebrand of California, and Percy Bridgman of Harvard, on Caedmon records, like poets, for posterity. There are many stories to be found in the sequences of brilliant teachers and brilliant pupils; my own department is fond of pointing out that three Nobel Prize winners this year and last got their Ph.D.'s with Fermi at the University of Chicago.

There is more unusual material, too, such as the story of the Hungarian-American scientists so brilliant that the others call them the "men from Mars." Or the story of such a man as Leo Szilard, a strange and contradictory thinker, who has surely influenced history by his unique role in starting the atomic bomb project as well as by his pioneer landmark papers in a dozen fields. The lighter material would include the amusing yarns that all scientists know about the hobbies of their favorite personalities. There are the mountain climbers; and Luiz Alvarez' parlor tricks; Richard Feynman's lockpicking; Arthur Roberts' musical compositions; and the insults, and the jokes—like the story of the Hungarian who had a sign over his desk that said "Being Hungarian is not enough."

And there are not only past stories, but future stories in the making, the men who may get the Nobel Prizes next year, and the year after.

When the stories of these personalities in science begin to be told, I suspect that we will find that all the men have one common characteristic: they are having fun. And the fun will be contagious. It has been said that the only peo-

## Incompleteness

The intelligent layman should be told of a third quality, the incompleteness of science.

All science has gaps in it. The most familiar are the inevitable small gaps, the data that one could still go on taking, the unexamined minor assumptions, or the unresolved questions. Most of these do not bother us because we realize that a scientific age is an age of tentative conclusions and working rules that may well have to be changed later. Yet it is important for us to emphasize this incompleteness, especially to the young, because they have hopes and aspirations and they want an open-ended story, with something left for them to do when they finally take our places.

What is not so often realized is that science is incomplete in more serious ways, with gaps that scientists themselves, tied to their own narrow specialties, hardly realize the existence of. In some ways, for all its diversity, science is narrower now than it has ever been before. Few of the men who work on photosynthesis know anything about physics; few of the men who work on nervous tissue know any organic chemistry; few of the men who work on the brain have any understanding of the mind. There are exceptions. An Enrico Fermi or Edward Teller or Harold Urey can work on stars or nuclei or molecules, just as his fancy strikes him. A John von Neumann can work on quantum mechanics as well as the theory of games. A Percy Bridgman can work on solids as well as logic. But for every such man, there are hundreds who spend their lives repeating the kind of experiments they did for their doctor's degree.

Even the intellectual leaders are blind to some fields. For over a century, some of the greatest physicists, Young and Maxwell and Helmholtz and Schrodinger, thought it of the greatest importance to study human visual perception. Today, I daresay not one of the twenty leading physicists in this country would have even a casual interest in this subject. Likewise, interest in the philosophy of physics has dropped almost to zero among the bright young men; yet this field may simply be waiting for a new Ernst Mach who will stir it up and pave the way for another revolution like relativity. And we have

all noticed such blind spots in the more technical fields, where it has suddenly been discovered, for example, how badly everyone has been neglecting oceanography, an area perhaps of central importance for our future food and resources.

I think these gaps cry out for reviewers and critics broadly trained and broadly read, who are competent to see what the neglected areas are and to encourage the young to go into them. A balanced and vigorous science requires a balanced and vigorous criticism. To paraphrase Clemenceau's remark that war is too important to be entrusted to generals, science is too important to be left to the scientists. Intelligent outside evaluation is good for a department, it is good for a university, and it would be good for science itself. The incompleteness of science is a challenge to great criticism. It is a challenge which I think will be met in the very finest presentations of science to the public.

## The Life of Man

It is a thrilling thing to be participating as actor or observer in the scientific revolution of our times, as science enters and transforms the life of man. Some are depressed by the hard work that must be done to make a world, and by the constant threat of failure and catastrophe. Some say philosophy has failed. I think this is only a momentary lapse between the old philosophy and the new that rises already in the laboratories. I think this century marks in history a revolution in man's outlook even more profound, if possible, than the accompanying revolution in science and technology. Man has suddenly found himself. He has explored all the earth and stepped outside it. He taps the sun's source of energy and stands ready to manipulate the weather and use the oceans. He measures back to the beginnings of time and out to the ends of space and sees his own sudden emergence, a thinking creature spun out of light and air and water and holding power in his hand, yet probably only one of millions of such creatures on other worlds.

And the power man holds is not only technical power but something far greater still, evolutionary power. He creates new species of plants and animals, halts or speeds up evolution, ma-

examined before? Will it be Cy Levinthal or some of his competitors, racing to see who can crack the great cryptogram, the code that translates the DNA molecule into the other cell materials? Or Theodore Puck, with his method of culturing perfect tissue cells? Or Albert Coons, with his fluorescent method of labeling antibodies?

The shrewdness of such men in reasoning and experiment has brought a new atmosphere to biology. Needless to say, the older scientists are not entirely sympathetic. Oversimplification, they snort. One eminent gentleman said, and I quote: "You know there are scientists, and there are people in science who are not doing science at all. We need their auxiliary work—they build apparatus, they make minor studies—but they are not scientists."

To which the young microbiologist replies: "Well, there are two kinds of biologists, those who are looking to see if there is one thing that can be understood, and those who keep saying it is very complicated and that nothing can be understood."

Sixty years ago when Pasteur was also trying to see if there was one thing that could be understood, the audience hung breathless on his results. I think this could happen again today. At any rate, molecular biology is, next to nuclear physics, the most intellectually exciting field for a young person to enter at the present time.

A third area, still more biological, is that of the recent work on evolution discussed at the Darwin Centennial Celebration this past fall at the University of Chicago. This celebration honored the 100th anniversary of publication of "Origin of Species." Several of the papers offered dramatic new illustrations of the Darwinian principle of evolution. One of these by Nicholas Tinbergen demonstrated that it is not just bones and muscles that evolve but also behavior, and he gave numerous examples of such evolution as found in the behavior of birds that nest in cramped and dangerous places.

In another paper, F. Clark Howell and Sherwood Washburn showed from the study of old skulls that man's brain has increased in size rapidly since he began using tools and fire, and is now almost three times as large as it was

then. Another study, by Cesare Emiliani, showed that this evolution of our brains may have taken a time much shorter than anyone has supposed, only a few hundred thousand years according to new geological dates. In short, intelligent man, as we know him, may have developed with dramatic suddenness as a result of using his hands to manipulate the world around him. Perhaps we are still developing at the same remarkable rate. It was better brains that determined which of the man-creatures would survive then; and it is better brains that will help us to survive now, we hope.

At the Darwin conference there was also much said about man's population problem today, which is a terribly timely aspect of evolution. There was something like a three-cornered debate on population, between the grandson of the founder of evolution, Sir Charles Darwin; the biologist, Sir Julian Huxley; and another Nobel Prize winner, H. J. Muller. Darwin says that in 50 to 100 years, the overcrowding of our increased population will destroy our civilization forever, and cannot be reversed, because people and groups who want to have many children will go on having them, whether it is good for the whole community or not. Huxley is more optimistic and thinks the population explosion can be stopped if we are intelligent enough to find incentives for stopping it. And Muller says that it is already urgent for us to take really dramatic steps, that is, to begin selective breeding, if we want civilization as we know it to continue.

All three men are united as scientists in saying that we are doomed if we do nothing to reduce our birth rates; they differ only in how much they think, as hopeful men, that we can do nationally and internationally about the problem. Many people may not approve of scientists offering to give their scientific knowledge and counsel to human affairs in this way, just as many people did not approve of the theory of evolution itself a century ago. But I think that the reporter who has the courage to try to transmit this population debate to the public in a full and fair way may find that he has a story as exciting, as controversial, and finally as important to history, as the debate over evolution itself ever was.

# Research on Cancer Viruses

JOHN R. HELLER, M.D.

THERE IS NO DOUBT that virology now holds great promise in research efforts on the cause and prevention of cancer. Virology has but recently attained this high status. Only in the past few years has the accumulated evidence of a half century of investigation proved sufficient to convince the more skeptical scientists that viruses cause cancer in animals.

The French bacteriologist Amédée Borrel was the first to make the suggestion, in 1903, that cancer might be a viral disease. His countryman, the eminent virologist Charles Oberling, later pointed out in "The Riddle of Cancer" that Borrel reached this conclusion when he failed to find the "microbe of cancer." For years his idea was defensible "mainly because no other offered a satisfactory interpretation."

Then, in 1908, the Danish scientists V. Ellerman and O. Bang succeeded in transmitting leukemia from one chicken to another by injecting cell-free filtrates of blood and organ extracts. At that time, however, leukemia was not generally considered a neoplastic disease, so their work did not receive much attention.

Two years later, Dr. Peyton Rous, working at the Rockefeller Institute in New York, transferred certain spontaneous tumors of chickens by cell-free filtrates. One of these neoplasms was the source of the Rous sarcoma virus. This work was viewed with some skepticism because of the prevailing opposition to an infection theory, but subsequent work established beyond any doubt that these were true neoplasms and that there were no living tissue cells in the

filtrate. Now we know that Rous' discovery marked an important stage in the history of experimental cancer research. The Rous sarcoma dramatically progresses in degree of malignancy through successive passages in the laboratory, either by cell transplants or tumor filtrates (fig. 1).

In the early thirties, a young man named Dr. Richard Shope, also at the Rockefeller Institute, was studying rabbit tumors—in particular, a papilloma occurring in certain wild cottontail rabbits. Using the same basic technique employed by Rous, Shope extracted and filtered the papilloma tissue and injected the filtrate into domestic rabbits. Figure 2 shows the results after various periods of time.

The Shope papilloma agent cannot be recovered from tumors in the domestic rabbit; the animal can be infected with a filtrate, but the papillomas that arise generally cannot be transmitted from one domestic rabbit to another. Nevertheless, the presence of a virus is signified by the appearance of antibodies in the blood as the tumor develops.

Several other virus studies bore fruit during the thirties. In 1934, Dr. Balduin Lucké at the University of Pennsylvania described the transmission by a cell-free extract of kidney tumors in the leopard frog.

At the Roscoe B. Jackson Memorial Laboratory, in Bar Harbor, Maine, a geneticist, Dr. John Bittner, and others were working with inbred mouse strains. He made reciprocal crosses between high and low mammary tumor strains of mice, expecting to find approximately the same incidence of tumors in the progeny of high-strain mother-low-strain father crosses and low mother-high father crosses. But only the progeny from mothers of the high-tumor strains had the same high incidence of cancer.

In studies to determine the nature of the

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*Dr. Heller is director of the National Cancer Institute, National Institutes of Health, Public Health Service, Bethesda, Md. He will become president of the Memorial Sloan-Kettering Cancer Center, New York City, on July 1, 1960.*

nipulates heredity like chemistry, and prepares to turn his own flimsy organism into whatever fantastic and brilliant and powerful form he most desires. The whole future is open-ended, waiting for us. This is not a time of philosophical decay but a time of birth. In the midst of our worry and fear, man reasoning, man the

creator, is about to be born. The old philosophies will burst off and blow away, unable to contain so fierce a fire. From now on, in every century, man will look back and say, this was the one.

When we speak of the sweep and excitement of science, we are speaking of the cradle of man.

## PUBLICATION ANNOUNCEMENTS

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(With the above three "Public Health Papers" WHO launches a new series designed to stimulate international thinking, discussion, and planning by the publication of personal ideas, observations, and suggestions of individuals or groups.)



**Figure 3. Autopsy of mouse inoculated when newborn with polyoma virus**

trate by carrying it in tissue culture. When newborn mice were injected with this filtrate, the results were remarkable (fig. 3). Not only did the mice develop primary parotid tumors, but 22 other types of tumors as well, including tumors of the thymus, adrenal glands, and mammary glands. The agent was thus named "polyoma virus." Some of the mice developed tumors within 6 weeks. Again, none developed leukemia. The investigators obtained similar results when they inoculated mice with mouse leukemia extracts incubated in tissue culture.

It is now widely believed that Gross' original material contained two viruses, the leukemia virus and the polyoma virus.

Stewart and Eddy have also shown that the polyoma virus has the unusual ability to cross animal strain and species barriers, for, although a mouse virus, it produces tumors in hamsters and rats as well.

A study conducted at the Sloan-Kettering Institute for Cancer Research in New York City about 3 years ago shed new light on the virus-tumor relationship in animal leukemia. Dr. Charlotte Friend reported her discovery of a virus that induced a leukemia-like disease in adult as well as infant mice within 2 to 3 weeks after inoculation.

Dr. Joseph Beard, the eminent virologist at Duke University, has pointed out that the studies by Friend and Gross have "firmly established the principle of virus etiology of well-known examples of mammalian leukemia." And, he adds, "There now exists a considerable body of information which is not only compatible with the hypothesis of the viral etiology of human leukemia, but which provides a substantial and reasonable background for pursuing investigations in man" ("Nature of the Viruses of Avian Myeloblastosis and Erythroblastosis" in Proceedings of the Third National Cancer Conference).

Dr. Leon Dmochowski, who with the electron microscope photographed virus-like particles in a variety of mouse and chicken tumor tissues, has conducted some interesting studies on human leukemia. In a collaborative study at the University of Texas M. D. Anderson Hospital and Tumor Institute in Houston, Dr. Dmochowski reported seeing virus-like particles in a biopsy from an enlarged cervical lymph node of a patient with acute lymphatic leukemia. He also reported that cells in the lymph nodes had undergone a number of changes similar to cell changes in affected organs of mouse leukemia and chicken lymphoma-





**Figure 1.** Sarcoma in the wing of a chicken 10 days after inoculation of the most potent Rous sarcoma virus preparation currently available

mother's influence, Bittner foster-nursed mice from high-tumor strains with mothers of low-tumor strains. The foster-nursed mice were relatively or entirely free of cancer, and so were their descendants for generations. In later studies, the reverse was also shown to be true. It was also found that a low-tumor strain mouse had to receive milk from a high-tumor strain foster nurse within about 10 days of birth, if it was to develop cancer. Thus was discovered the Bittner milk agent, now accepted as a virus.

### Research in the Fifties

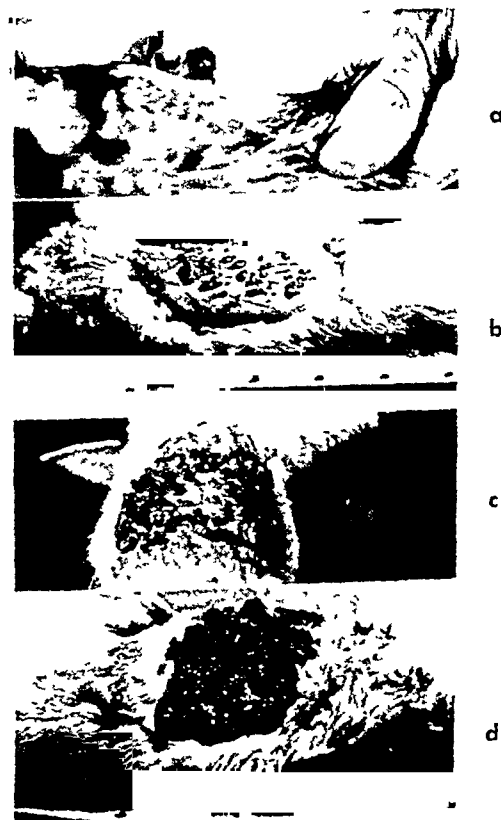
It was a long time before the studies conducted by the early pioneers of virus-cancer research were generally considered to be anything but isolated laboratory curiosities. Other paths of cancer research appeared vastly more promising than virology. In the last decade, however, a number of investigators have become interested in virus-cancer research, and have produced an impressive amount of information about animal tumor viruses and the fundamental nature of viruses and cell components.

The beginning of this new, active period is marked by a study by Dr. Ludwik Gross of the Bronx Veterans Administration Hospital who in 1951 successfully transmitted mouse leukemia with filtered extracts by injecting newborn

mice of a susceptible strain. His best results were obtained when he inoculated mice no more than 16 hours old. Gross also reported an unexpected result—some of the inoculated mice developed tumors of the parotid, a salivary gland, and miscellaneous other types. Many of these tumors rarely, if ever, occur spontaneously in uninoculated mice of this strain.

At the National Cancer Institute, Dr. Sarah Stewart attempted to reproduce Gross' results. But, although she used the same method, none of the mice she inoculated got leukemia. They developed primarily parotid gland tumors instead.

Teaming with Dr. Bernice Eddy, also at the National Institutes of Health, Dr. Stewart increased the potency of the parotid tumor fil-



**Figure 2.** (a) Papilloma on the inner left thigh of a wild rabbit (under the microscope these growths resemble extremely keratinized warts), (b) result of inoculation of domestic rabbit with filtrate of the papilloma tissue after 23 days, (c) after 52 days, and (d) after 118 days

training of biologists, zoologists, and chemists in the basic medical sciences related to virus-cancer research; (c) improvement of sources and distribution among laboratories of living host and viral materials; and (d) expanded financial support to include large-scale interdisciplinary explorations over long periods of time. These are excellent suggestions, and most of them have already been acted upon.

Additional conferences were held in November 1959 and in March 1960 to further explore the problems of research on viruses and human cancer. These meetings were attended by many of the Nation's leading virologists.

Establishing the role of viruses in human cancer might seem a simple matter of finding virus in malignant tissue and then demonstrating that it caused the disease. However, there is a fundamental difficulty here: at the present time we have no way to demonstrate the carcinogenic effect of viruses on humans. We must, therefore, develop laboratory techniques that will attack the problem indirectly.

A key tool in the development of such techniques will probably be tissue culture. The number of laboratories where human cells are being grown in tissue culture has greatly increased in recent years, thus facilitating the search for and study of viruses in human tissue. Research of this nature is making wider use of techniques such as treatment with X-ray or cortisone that permit human tissue to grow in experimental animals.

Other fundamental studies are equipping us with knowledge of the relationship between the host animal and the virus. Dr. Ray Bryan at the National Cancer Institute has conducted some revealing studies on the Rous sarcoma virus in chickens. He has shown that there is a quantitative relationship between the amount of virus inoculated and certain biological properties of the tumor such as size, length of time before the tumor develops, and length of time before it kills the animal. In other words, Bryan's work makes it possible to refute the old argument that a tumor cannot have been caused by a virus if the virus cannot be extracted.

One of the principal questions that must be answered is, how do viruses enter a cell and make it cancerous? For many scientists, studies on nucleic acids offer the most promise

in this area. In cells the nucleic acid DNA is localized in the chromosomes, which carry the genetic information of cells and determine their form and function. Cells also contain another form of nucleic acid, RNA, most of which is in the cytoplasm.

Viruses are known to consist largely of nucleic acid, either RNA or DNA, and protein. But until fairly recently it was not known whether nucleic acid alone could be responsible for virus activity. Then, almost simultaneously, Dr. Heinz Fraenkel-Conrat at the Berkeley Virus Laboratory and Dr. A. Gierer and Dr. G. Schramm in Germany found that the RNA of the tobacco mosaic virus showed infectious activity.

This work pointed up the vital role of nucleic acid in virus activity, and of course, the possible role of nucleic acid in cancer.

In January 1960, scientists at Sloan-Kettering and the National Institutes of Health reported that DNA has been isolated from the polyoma virus discovered by Stewart and Eddy. Cancer was produced in laboratory animals by inoculating them with tissue culture fluids in which the isolated viral DNA was carried. This strongly indicates that DNA can enter a living cell and change the DNA of the cell to make it cancerous.

Such work has breathtaking implications, and it acts as a powerful stimulus to the scientific imagination. Studies on bacteria and bacterial viruses have shown that genetic material, and thereby hereditary traits, can be transferred by a virus from cell to cell, by a process known as transduction. This transfer might cause an abnormal, malignant change in the cell. Or, a viral nucleic acid might shed its protein coat and enter a cell, become incorporated into the genetic structure of the cell, and modify it so that the cell begins to reproduce abnormally. Bacteria studies also support the concept that latent viral nucleic acid in a cell might be activated by chemical or physical agents, and thus initiate malignant growth.

These possibilities and many others constitute a broad challenge to the scientific community as a whole. Intense, collaborative efforts in many disciplines, genetics, cellular biology, chemistry, immunology, to cite just a few, are needed. The National Cancer Institute is en-

**Figure 4.** Mice inoculated with the Moloney virus center at 64 days of age, and right at 48 days. Left, a control C strain mouse



tosis. Visceral lymphomatosis is a common malignancy of chickens, known to be caused by a virus.

A year ago, one of our scientists at the National Cancer Institute reported a discovery that is, I believe, a real landmark in virus-cancer research. It is a fascinating story, beginning with Dr. John Moloney's studies of the properties of Sarcoma 37, an experimental mouse tumor. In the course of his investigation Dr. Moloney prepared a cell-free extract of the tumor and injected it into healthy mice. The result was quite unexpected. Within 8 months, the animals developed a type of leukemia that is indistinguishable from spontaneous leukemia in mice.

Following this lead, Moloney prepared extracts from leukemic tissue of the mice that first developed the disease, and injected these extracts into mice. By repeating this process several times, he obtained an extract so virulent that it caused leukemia within 10 weeks in 100 percent of the mice injected on the first day of life.

The leukemia agent is a virus, and the electron microscope has revealed particles that may be the virus. Unlike other mouse leukemia viruses, the Moloney virus causes the disease in several different strains. It is also active

against adult as well as newborn animals. None of the mice inoculated with the virus has developed any form of cancer except leukemia (fig. 4).

Along with the numerous reports of new virus-caused animal tumors, there have been many discoveries, often seemingly unrelated, in research on virus and cell constituents, their modes of behavior, and other characteristics. Recently we have come to see that all these results are very likely pieces of the same large and intricate puzzle.

#### Avenues of Research

This realization has been greatly responsible for the acceleration and vitality of virus-cancer research today. At the same time, the present phase of research in this field presents a number of problems and obstacles that demand wise and careful attention. With this need in mind, 15 distinguished scientists met at the National Institutes of Health in September 1958 to explore new approaches in virology and other sciences that might lead to major advances in human cancer. The group made four proposals: (a) basic study of viruses and animals, using electron microscopy and available animal tumors as models; (b) greater emphasis on

# Experiment in Enthusiasm

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**S**EVEN years ago there were 1,712 unhospitalized people in Mississippi with known active tuberculosis, 90 percent of whom were not receiving any sort of care; and there were 783 beds for tuberculosis patients, 777 of them occupied. New cases were being discovered every day. Four years later this backlog of cases had been cleared up, and by 1956 nearly 85 percent of the newly reported cases were being treated. How was this done?

"By building more tuberculosis hospital facilities," probably would be the answer of people familiar with tuberculosis control and the recommendations for hospitalization.

But there was one big difficulty. Among the 48 States in the Union at that time, Mississippi ranked 48th in both per capita and spendable family income. Obviously, this solution was out.

Although there were in existence drugs that were successful in treating tuberculosis, their cost and difficulty of administration made any sort of mass approach impractical. Then isoniazid came along and a successful formula was found: isoniazid, in combination with other drugs, and enthusiasm, administered in equal parts.

With this formula, the Mississippi State Board of Health made a new approach to the

problem. A statewide outpatient drug therapy program was started for the large number of patients with active tuberculosis who could not be hospitalized. The organization of the State health department as well as the new drugs made such a "home treatment" program practical. Health departments in each county had X-ray facilities, and State laboratory services were available. The county health departments were supervised by the State board of health so that there was uniform administration, as well as comparable treatment. The State sanatorium was also under the direction of the board of health, making the coordination of home care with hospitalization easier. It goes without saying that no undertaking of such proportions could have succeeded without the wholehearted support of the workers in the county health departments and the cooperation of private physicians throughout the State.

The objectives of this program were simple: to protect the health of the community by reducing the sources of infection and to improve the health of patients through treatment. The program was not intended to replace other forms of care, and hospitalization was still recommended whenever practical. Both patients with active pulmonary disease and with primary tuberculosis were to receive drug therapy. After the program got underway, patients discharged from hospitals with recommendations for therapy, regardless of type of discharge, were also included.

The local health departments had the responsibility for making the program work. Whenever possible, treatment was to be provided either by or under the direction of the private physician of the patient's choice. How-

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*Dr. Blakey is director of preventable disease control, Mississippi State Board of Health. The other authors are with the Bureau of State Services of the Public Health Service: Dr. Hofstra as chief of Program Services, Chronic Disease Branch; Miss Gilbertson as public health nursing consultant, and Miss Wyman as public health adviser, Tuberculosis Branch.*

couraging such activities through a greatly expanded program of grant support for virus-cancer research. Some of the investigators participating in this program are virus experts entering the cancer field for the first time. Emphasis is on the long-term support of the scientist himself, as opposed to support of a specific project, and support of some of our grantees in this field has been recommended for periods up to 10 years. I believe that these practices, which were recommended by our advisers, will help to insure the most productive work possible in virus-cancer research.

If viruses do cause cancer in man, and if these viruses are isolated, what then? How will we apply our knowledge to help save lives?

### Prevention

Naturally, prevention is what we look to as an end result of all cancer research. There has been some success in developing vaccines against virus-caused cancer in animals. Stewart and Eddy have devised a procedure that immunizes hamsters against polyoma virus. Friend has developed a formalin-killed vaccine that protects mice challenged with live leukemia virus. And successful vaccines against visceral lymphomatosis in chickens have been developed by Dr. Ben Burmester of the Department of Agriculture's Poultry Research Laboratory in Michigan. On the other hand, attempts to detect antibodies against the Moloney virus have been unsuccessful, and have therefore hindered work on the development of a vaccine from this virus. This illustrates an important point: the isolation and identification of a cancer-producing virus may not lead to the speedy development of a vaccine.

Some day, it may be possible to produce a vaccine that will prevent cancer from developing in man. It might, of course, take years to determine its effectiveness, unless a vaccine for acute leukemia were developed. In that case, the effect of a vaccine given to babies would soon be obvious, since acute leukemia most often strikes young children.

If human cancer is a virus disease, another approach might be the use of drugs designed to destroy the virus either before it induced

cancer or very early in the course of the disease. Laboratory studies of a virus that infects bacteria have shown that selective action by such drugs is possible. The virus studied induces the formation of a particular enzyme necessary for the reproduction of the virus within the cell. A powerful anticancer agent, 5-fluorouracil deoxyriboside, will seek out this enzyme, which is only in the bacteria infected by virus, combine with it, and thus block the reproduction process.

Some intriguing studies of cancer treatment in humans have shown that infection of cancer cells with certain viruses destroys some of the cells. The effect is temporary, since the patient soon develops antibodies against the virus. In further studies, attempts are being made to inhibit the host's production of antibodies against these viruses, to develop methods of reaching the cancer with sufficiently powerful doses before antibodies develop, and to produce tumor-destroying properties in other human viruses.

Virus-cancer research has come a long way in the past 50 years. And the efforts of dedicated scientists in countries all over the world assure us that our knowledge of this complex field will steadily increase. This is indeed an era in which we are continually having to re-evaluate and readjust our concepts. It is difficult to imagine what new findings may be just beyond today's horizon. But I am sure it is no mere dream that research on viruses and cancer may eventually give us valuable new knowledge and skill that will help to prevent or arrest the development of many human cancers.

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have active tuberculosis in 1953 were treated under the program, nor to what extent cases newly reported in the following 2 years participated. However, 3,055 patients were taken care of during the 4½-year period between the beginning of the program and the 1957 study. If what happened in 1956 is any indication, and it is felt to be a good one, then most of the people who needed treatment got it. In that year nearly two-thirds of the newly reported active cases began home treatment, and another 22 percent were handled by private physicians and hospitals. Since about 5 percent of the new cases that year were reported at the time of or after death, only about 15 percent had no treatment or treatment was unknown.

Fifty-four percent of all the patients treated during the 4½ years had far-advanced disease when starting home therapy, and another 29 percent were in the moderately advanced stage. A substantial portion of the patients of working age (27 percent) were working either full time or part time when they joined the program. The patients were grouped in the following ways:

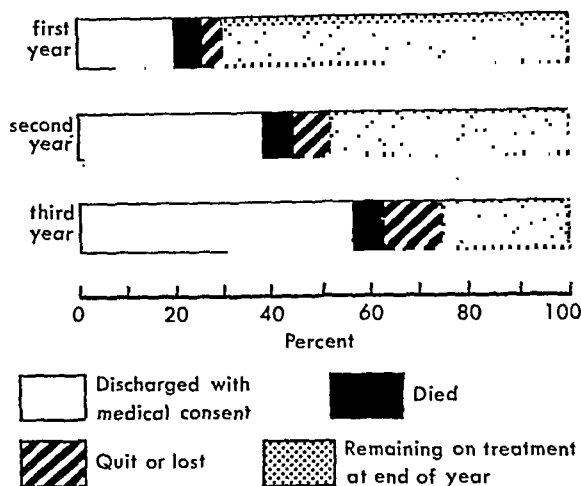
Characteristic	Percent
White .....	47
Nonwhite .....	53
Male .....	59
Female .....	41
25-64 years of age .....	71
All other ages .....	29

About one-fourth of the patients treated were discharged from the hospital to start home treatment and were not subsequently hospitalized. For obvious reasons, the medical characteristics of this group were quite different from those of the group who entered without hospitalization, both at the beginning of home treatment and at the time of the study.

Nearly 90 percent of the people who started treatment without hospitalization had active tuberculosis, and 60 percent had positive sputum. Among those who started treatment after leaving the hospital, 46 percent were active, 42 percent arrested, and 80 percent had negative sputum.

Reasons why patients stopped treatment during the 4½ years from the beginning of the

**Figure 1. Distribution of patients at the end of successive years of treatment with drugs in Mississippi, 1953-56**



NOTE: Discharged with medical consent includes patients who transferred to hospital, moved, or changed supervision.

program to the time of the study are given below:

	Program group (percent)	Hospital discharge group (percent)
Medical consent.....	29	63
Transferred to hospital.....	37	0
Moved or changed supervision.....	11	16
Refused or lost.....	14	17
Died .....	9	4
Total.....	100	100

Since the patients who had some hospitalization were in better condition when they started home treatment, it is not surprising that 63 percent of this group were discharged with medical consent as no longer needing treatment. Only 29 percent of those who entered the program without prior care were so discharged. On the other hand, the fact that more than one-third of the latter group were hospitalized eventually indicates that ambulatory treatment in many cases cannot be expected to be an adequate substitute for hospitalization. As far as keeping patients under treatment was concerned, whether or not a patient had had any hospitalization did not seem to matter.

The persons who started home treatment without previous hospital care did not get well

ever, if needed, the health departments provided part or all of the necessary medical, nursing, drug, laboratory, and X-ray services, as well as instruction of patients.

The original policy statement of 1953 defined dosage and treatment regimens for streptomycin, PAS, and isoniazid, with all three drugs to be given simultaneously to every patient when at all possible. The necessity of bed rest and proper nutrition was stressed to patients entering the program. In 1956, the original policy statement was revised to include recommendations for length of treatment by form and extent of disease.

Because of the financial situation in the State, the board of health was unable to provide any additional funds for drugs when the program was started, and the local health departments were given the responsibility of getting the necessary money in whatever way they could. This was done. The local tuberculosis associations and county boards of supervisors proved to be major sources of funds. Civic and religious organizations and individual citizens also contributed. In spite of this informal approach, local health department staffs feel that no patient was denied drugs or had treatment delayed for lack of them.

Starting in 1954, the State board of health was able to distribute a limited amount of drugs to local health departments in proportion to the amount of local funds used in buying drugs for totally indigent patients.

Since the health departments purchased the drugs in large quantities, they were able to obtain them at reduced cost. Thus many patients found it possible to pay for their own drugs. Whenever practical, patients were encouraged to contribute something toward the cost, even though in many cases this amounted to little more than a token gesture. It helped ease the burden on the health departments, and they believe it had a good psychological effect on the patients, encouraging them to maintain treatment.

The health departments found it necessary to schedule regular hours for taking X-rays and giving streptomycin injections. Staffing these additional clinics, instruction of patients, and maintaining continuity of treatment was accomplished chiefly by the nurses. In 1955, re-

gional consultation clinics were established by the State board of health to aid county health departments and private physicians in diagnosis and treatment. Each health department had access to expert medical consultation at least once every 3 months. These clinics also encouraged better use of both the outpatient and inpatient facilities of the State sanatorium.

### Evaluation of Accomplishments

In the early years of the home treatment program, the demands on everyone were so great that there was little attempt to evaluate progress. After 4 years of operation there was a growing recognition of the need for factual information, and in 1957 the Mississippi State Board of Health and the Tuberculosis Branch of the Public Health Service began a cooperative study of the program (7). The material discussed hereafter comes chiefly from this survey.

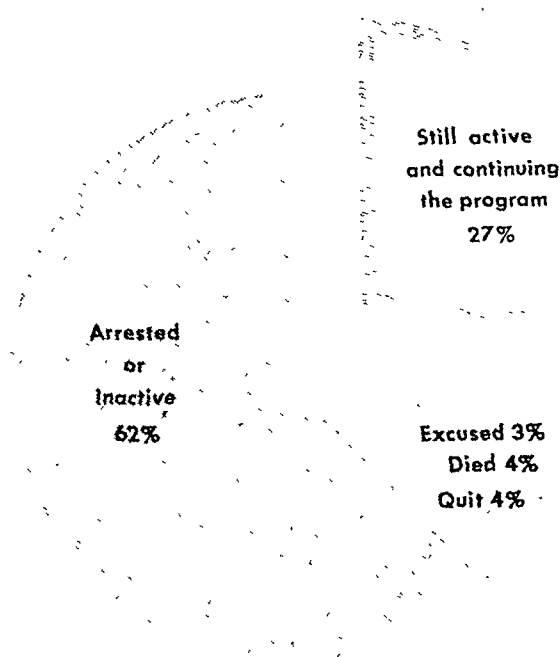
The study showed that the home care program was successful in achieving its primary aim, protection of the health of the community by bringing the large number of patients with active tuberculosis under treatment and thereby reducing sources of infection. When the statewide plan was put into effect in 1953, 25 counties had already started home treatment for tuberculosis patients. By the end of the first year of operation, 69 counties had entered the program, 9 more joined the next year, and by the end of 1955, every county in the State was participating.

The number of patients participating in the program showed a similar increase. In 1953, 630 patients were being treated; by 1956 the total had risen to 1,820. There was no serious difficulty in persuading patients to accept or continue treatment. Sixty-three percent started treatment within 1 week after recommendations, 83 percent within 1 month, and 95 percent within 6 months. At the time of the study, 82 percent were thought to be taking their drugs regularly. Only 8 percent discontinued drug therapy for as long as 2 months, and only 15 percent refused treatment or were lost to supervision after they started home treatment.

It was not possible to determine exactly how many of the 1,712 patients who were known to

Nearly two-thirds of newly reported cases of active tuberculosis  
were either arrested or inactive  
after two years

of combined  
home treatment  
and hospital care  
(about one-third  
were hospitalized  
for a time)



Even if complete data had been available on all patients on home care, their progress still would not have received proper evaluation. The job was simply too large for the two part-time consulting physicians to handle. In 1956, for example, the cases of only 60 percent of the patients on drug therapy were reviewed by the regional consultants.

Supervision also proved to be a problem. About 25 percent of the patients who started home care were working, even though they had active disease. At the time of the study, nearly 30 percent of the patients with positive sputum were working.

A most glaring need was for treatment under more controlled conditions for the patients who failed to make satisfactory progress. A significant portion of the patients (20 percent) failed to show a conversion in their bacteriological status after 6 months or more of treatment. Furthermore, a substantial portion (27 percent) still had active disease after 2 years of treatment.

#### Discussion

Two years have passed since the survey and steps have been taken to correct some of these

weaknesses. In the area of administration, the program has been tightened by making the director of the division of preventable disease control, under the general direction of the executive officer of the Mississippi State Board of Health, responsible for coordination of the home treatment program with the State sanatorium.

Currently, when any change in a patient's status occurs, the information is immediately reported to all the other agencies participating in his care, thus improving considerably the continuity of treatment. In addition, new patients or patients who have failed to make satisfactory progress without hospitalization can be quickly admitted to the sanatorium by the two chest specialists.

Although it has not been possible to increase the number of cases reviewed by these consultants at field evaluation conferences, their work has been made more productive through greater selectivity in the cases to be reviewed. Guides are also being developed which will help even more in this selection.

The 1957 study revealed that a number of patients entered the home treatment program with the extent of their disease, bacteriological status, or both, unknown. Today, patients are

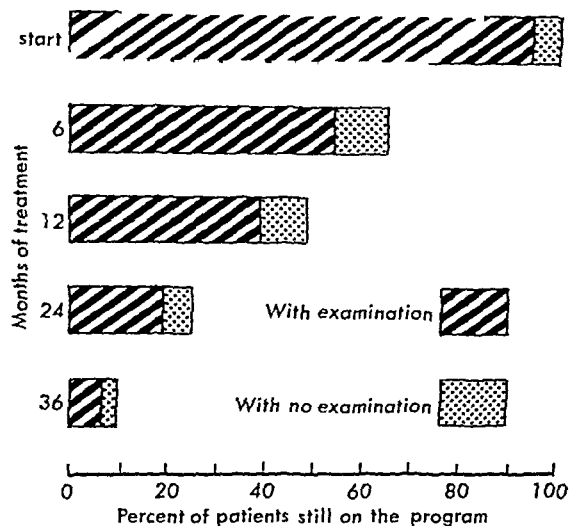


overnight (fig. 1). However, after 3 years, 56 percent had been discharged with medical consent.

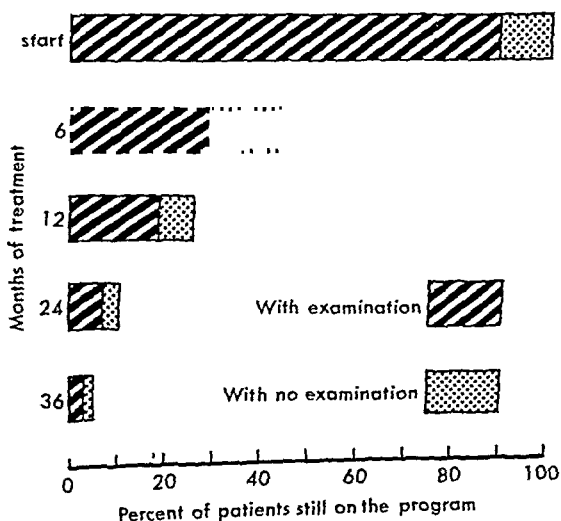
A group of newly reported active cases was studied in an effort to determine the therapeutic effectiveness of the program. The group

**Figure 2. X-ray and bacteriological examinations of patients with active tuberculosis treated with drugs in Mississippi, 1953-56**

*X-ray examinations at completion of specified number of months of treatment*



*Bacteriological examinations for patients with active disease*



NOTE: Patient was said to have had an examination, if examination was made within 3 months before or after date due.

was composed of patients with no previous medical care prior to starting treatment at home. All had at least 6 months of treatment, and some were hospitalized at some time during the 2 years they were studied. After 2 years of treatment, 62 percent were either arrested or inactive, 27 percent were still active and continuing treatment, and the remainder had stopped treatment before their disease status had changed. However, the patients still being treated showed improvement. Nearly three-fourths had positive bacteriology at the beginning; after 2 years only slightly more than one-fourth still had positive sputum and the percentage of patients with negative bacteriology increased from 18 to 51 percent. The increase from 10 to 22 in the percentage of patients with unknown bacteriological status still considered to be active probably resulted from the absence of sputum after 2 years of drug treatment and the refusal of some patients to supply specimens.

## Flaws

Thus far the considerable accomplishments of the program have been presented. Successful as it proved to be, however, Mississippi started a crash program to meet an emergency situation and only the most confirmed optimist would not have expected some flaws to develop. In addition to the difficulties inherent in supervising patients at home, the study also revealed weaknesses in the program itself.

First of all, 13 percent of the patients started home care with an unknown bacteriological status. The sputum test was the only method used to make this determination. At the end of 3 years of program operation, there was still a significant proportion of the patients who were not receiving bacteriological and X-ray examinations at the proper intervals. These weaknesses are reflected in figure 2.

The development of a reservoir of patients with isoniazid-resistant organisms is a hazard in a program of this type. It was decided, however, that the main objective of the program, to lessen sources of infection, was of primary importance and the careful medical supervision of the dispensing of drugs would minimize this element of risk.

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Arrested  
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Still active  
and continuing  
the program  
27%

Excused 3%  
Died 4%  
Quit 4%

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A most glaring need was for treatment under more controlled conditions for the patients who failed to make satisfactory progress. A significant portion of the patients (20 percent) failed to show a conversion in their bacteriological status after 6 months or more of treatment. Furthermore, a substantial portion (27 percent) still had active disease after 2 years of treatment.

## Discussion

Two years have passed since the survey and steps have been taken to correct some of these

weaknesses. In the area of administration, the program has been tightened by making the director of the division of preventable disease control, under the general direction of the executive officer of the Mississippi State Board of Health, responsible for coordination of the home treatment program with the State sanatorium.

Currently, when any change in a patient's status occurs, the information is immediately reported to all the other agencies participating in his care, thus improving considerably the continuity of treatment. In addition, new patients or patients who have failed to make satisfactory progress without hospitalization can be quickly admitted to the sanatorium by the two chest specialists.

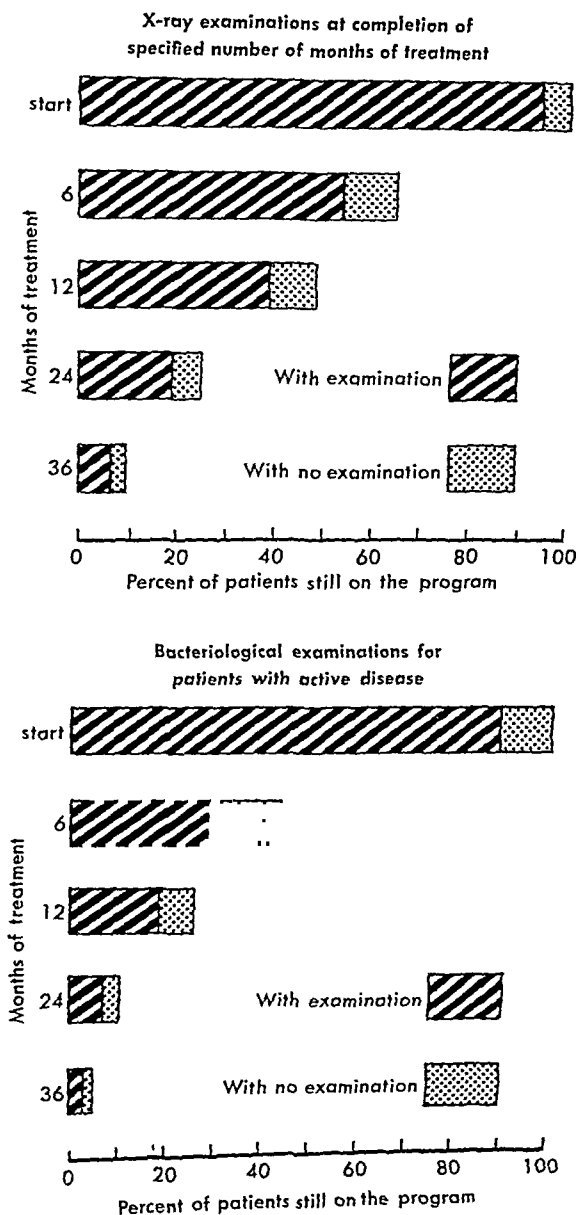
Although it has not been possible to increase the number of cases reviewed by these consultants at field evaluation conferences, their work has been made more productive through greater selectivity in the cases to be reviewed. Guides are also being developed which will help even more in this selection.

The 1957 study revealed that a number of patients entered the home treatment program with the extent of their disease, bacteriological status, or both, unknown. Today, patients are

overnight (fig. 1). However, after 3 years, 56 percent had been discharged with medical consent.

A group of newly reported active cases was studied in an effort to determine the therapeutic effectiveness of the program. The group

**Figure 2. X-ray and bacteriological examinations of patients with active tuberculosis treated with drugs in Mississippi, 1953-56**



NOTE: Patient was said to have had an examination, if examination was made within 3 months before or after date due.

was composed of patients with no previous medical care prior to starting treatment at home. All had at least 6 months of treatment, and some were hospitalized at some time during the 2 years they were studied. After 2 years of treatment, 62 percent were either arrested or inactive, 27 percent were still active and continuing treatment, and the remainder had stopped treatment before their disease status had changed. However, the patients still being treated showed improvement. Nearly three-fourths had positive bacteriology at the beginning; after 2 years only slightly more than one-fourth still had positive sputum and the percentage of patients with negative bacteriology increased from 18 to 51 percent. The increase from 10 to 22 in the percentage of patients with unknown bacteriological status still considered to be active probably resulted from the absence of sputum after 2 years of drug treatment and the refusal of some patients to supply specimens.

## Flaws

Thus far the considerable accomplishments of the program have been presented. Successful as it proved to be, however, Mississippi started a crash program to meet an emergency situation and only the most confirmed optimist would not have expected some flaws to develop. In addition to the difficulties inherent in supervising patients at home, the study also revealed weaknesses in the program itself.

First of all, 13 percent of the patients started home care with an unknown bacteriological status. The sputum test was the only method used to make this determination. At the end of 3 years of program operation, there was still a significant proportion of the patients who were not receiving bacteriological and X-ray examinations at the proper intervals. These weaknesses are reflected in figure 2.

The development of a reservoir of patients with isoniazid-resistant organisms is a hazard in a program of this type. It was decided, however, that the main objective of the program, to lessen sources of infection, was of primary importance and the careful medical supervision of the dispensing of drugs would minimize this element of risk.

# X-Ray Protection Techniques

WALTER R. STAHL, M.D.

*Oregon's radiation law, effective July 1, 1957, authorized a 2-year study of radiation exposure before promulgation of regulations and standards, discussed in a previous paper (PUBLIC HEALTH REPORTS, April 1960, pp. 331-336). The first phase was a survey of diagnostic X-ray units, which not only provided information on conditions in the State but also afforded an opportunity to offer suggestions for improvement in equipment and techniques. On the basis of inspections of several hundred units, supplemented by appropriate literature references, this paper discusses technical aspects of the survey, emphasizing methods for reducing exposure of personnel and patients. The results and their interpretation will be reported in a later paper.*

THE chief of a radiological health program is continually called on to interpret the "real" biological hazard of a given exposure, the probabilities of delayed effects after certain radiation doses, reasonableness of a particular procedure from the radiological viewpoint, or significance of a given shortcoming in a specific X-ray unit. He must be able also to interpret various aspects of radiological safety practice based on, but not fully covered by, recognized standards. Good concise background material on these questions has been published (1-3).

Meeting such demands requires extensive training in the entire field of radiological health. Preferably, the chief should have a degree in medicine plus perhaps 1 year of residency in radiology or a postgraduate year in radiological health. However, with sufficient personal effort, individuals with other back-

grounds may be able to assume the responsibilities.

Suitable short-course and long-term training is offered by the Division of Radiological Health of the Public Health Service. The Atomic Energy Commission also offers courses in radiological health, but so far these have dealt primarily with the control of the potential hazards of radioisotopes.

With a well-trained chief, the other personnel in an X-ray radiation safety program can have variable backgrounds and training. Particularly valuable is prior experience as an X-ray technician. In general, however, anyone with the approximate equivalent of a bachelor of science degree can be trained to survey X-ray units. Experience in reading instruments is helpful, as is some acquaintance with medical terminology.

The program chief may train his own personnel, regardless of background, so that the proper standards are applied in fieldwork. An orientation period of about 2 to 6 months is not unusual, with frequent group training in the field on X-ray units. The staff should be supplied also with suitable reading materials, such as glossaries of medical-radiological terms, manuals of radiographic techniques (4), and the materials of the National Committee on Radiation Protection (which are published as National Bureau of Standards handbooks, available from the U.S. Government Printing Office).

## Inspection Forms

Making complex value judgments concerning X-ray units in the field may be somewhat easier by the use of standard recording and recom-

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no longer being started on treatment without a minimum diagnostic workup. Emphasis is being placed on the techniques of collecting sputum as well as on the need for three sputum examinations at the time of every X-ray, and the tuberculin test is being used routinely in establishing the diagnosis. In addition, the State health department no longer accepts new cases as "pulmonary tuberculosis" if the necessary reporting on extent of disease and bacteriological status is not included.

Procedures have been developed also to facilitate data collection at the end of each year on the number of patients treated, length of treatment, and clinical status. This annual evaluation provides the State board of health with the necessary information for more precise planning of its treatment program, whether in the hospital or on an ambulatory basis.

The Mississippi home treatment program was started in 1952 because it was impossible to give

hospital care to many people who needed it. Now the day is not too far distant when every newly discovered case of tuberculosis in the State can be hospitalized first, and then, once they are on the way to recovery, released to continue treatment at home. When compared to some areas of the United States, this will be regarded as nothing unique, just good tuberculosis control. But the people in Mississippi who had to face the dismaying facts in 1952 know that this accomplishment in tuberculosis control could not even be mentioned today if it were not for the State experiment in enthusiasm.

#### REFERENCE

- (1) U.S. Public Health Service, *Tuberculosis Program: Evaluation of the Mississippi program of home treatment for tuberculosis*. Mississippi State Board of Health (distributors), Jackson, March 1959, 23 pp.

## Courses in Care of Premature Infants

In the fall of 1960, the Institutes for Physicians and Nurses in the Care of Premature Infants at the New York Hospital-Cornell Medical Center, under the sponsorship of the New York State Department of Health and the Children's Bureau, will begin their 12th year of operation. These institutes are designed to meet the needs of physicians and nurses in charge of hospital premature nurseries and special premature centers, and of medical and nursing directors and consultants in State and local premature programs. The attendance at each institute is limited to six physician-nurse teams. The program for physicians is of 2 weeks duration and that for nurses of 4 weeks duration. Participants pay no tuition fee and stipends are provided to help cover expenses during attendance at the institutes. Institutes for the 1960-61 year are definitely scheduled to start on the following dates: September 19, 1960; November 28, 1960; January 23, 1961; March 13, 1961; May 8, 1961. Early application for these institutes is essential since plans are contingent on the number of applications received.

Additional information may be obtained by writing Box 143, Institutes in the Care of Premature Infants, the New York Hospital, 525 East 68th Street, New York 21, N.Y.

form is being filled out. In addition, the X-ray safety program includes lectures at meetings of practitioners of various types. The practitioners are encouraged to read the available literature, such as the booklet on X-ray protection by the American College of Radiology (5).

Specific technical problems encountered in X-ray survey work are discussed in the remainder of the paper. References to the literature, of course, represent only a sampling of the many excellent articles of recent years. It should be noted, however, that a number of these articles were written by radiologists. Their standards are not always applicable, from a practical standpoint, to general medical or dental offices.

### Film Badge Monitoring

The Oregon survey revealed few instances of gross overexposure for operating personnel. This finding is consistent with reports of other surveys (6-8). Positive documentation and recording of doses by means of film badges, however, were infrequent.

The Oregon State Board of Health recommends film badge monitoring for all radiation users, although for small caseloads monitoring need not be continuous. At an approximate cost of \$1.50 per badge (for small quantities), the use of badges on two or three potentially exposed personnel for a month each year, for example, is not a major expense. Annual monitoring and special surveys whenever there is a significant change in equipment or caseload are recommended for the usual small X-ray installation.

The field personnel should be familiar with the so-called dental film monitoring method, which has been widely used, but certainly does not replace film badges. A paper clip is affixed to a plain dental film, which is carried in a pocket for a week or two and then developed. An outline of the paper clip, which appears at an estimated 25- to 40-mr exposure, is considered a positive result. Monitoring with dental films or film badges on walls, however, has little value for indicating exposure of personnel.

Pocket ionization chambers, encountered occasionally in hospitals, are useful as a supple-

ment to film badge monitoring. They tend to read low because of the softness of scattered secondary X-rays, and recording of the doses must be systematic and evaluated with caution.

For definitive advice on personnel protection, the best resource is familiarity with the standards for occupational exposure formulated by the National Committee on Radiation Protection, and published in the National Bureau of Standards Handbook No. 69. The permissible radiation is different for various parts of the body—hands, neck, lenses of the eyes, and gonads—and for the whole body, to be applied as appropriate.

The recent revision of occupational exposure limits abolished a specific weekly whole-body or gonadal exposure limit in favor of 3-month, annual, and cumulative limits. For surveillance purposes, however, the weekly maximum is 100 mr for continuing occupational exposure. The quarterly limit is 3 r and the annual limit is 12 r, but cumulative exposure is not to exceed the number of roentgens arrived at by multiplying age, less 18, by 5. Even moderately good protection leads to weekly exposures much below these limits, on the order of 25 mr per week (6,7).

Since 3 months is the shortest period for which a limit is now given and since the cumulative limit has been lowered, some film badge processors offer a double film badge: one packet to be replaced every 2 weeks and the other to be worn for 3 months. Use of this badge, which minimizes the recording of "fog" as actual exposure to radiation, seems desirable when prior exposure records are accurate and close to limits. As an alternative, wearing a single film badge for a month instead of 2 weeks would seem reasonable in most instances.

The Oregon Board of Health has not undertaken to supply film badges as part of its survey because of the expense and also because of a feeling that badges would be used more consistently if paid for by the X-ray unit owners. Further, the practitioner will have to make contact with a film badge distributor sooner or later, and the occasion of a survey is a good opportunity.

Film badges appear to be much more reliable than survey instruments for most personnel monitoring, although instruments are useful in

mendation forms. Ideally, these should be based on practical experience of several months duration. They should be concise and allow "checkoff" whenever feasible. Coding for future tabulation should be included. Suitable forms have been developed by the Division of Radiological Health, Public Health Service.

Oregon finds it practical to use such forms for on-the-spot reports of the inspections. They can be filled out in carbon duplicate, with a ballpoint pen or typewriter, the original given to the practitioner and the carbon copy retained for the office file. Although it might be charged that such reports are not written by experts, we believe that the advantages outweigh this disadvantage. First, they permit suggestions and recommendations to be given immediately to the practitioner. Second, the radiation expert back in the office usually does not have time to go over the field reports in sufficient detail to insure that his judgment of the situation will be better than that of the person on the spot. Third, writing of reports in the office cuts down efficiency of the fieldwork. Sound training in radiation principles for the fieldworkers and the use of standard forms with checkoff items prepared by an expert are key factors in this process.

The use of checkoff forms not only saves much time but also permits more detailed and uniform recommendations. Writing complete recommendations on any given X-ray unit could be an extensive undertaking. Merely putting down that "adequate coning should be provided," for instance, is almost worthless from the practical viewpoint. Details are needed on how to choose cones, the possible use of an adjustable cone, and so on. The use of a checkoff recommendation sheet does not, of course, replace individual verbal explanations on each important item during the office visit. Also, space may be used on the form for items not covered in the printed schedule. A face sheet summarizing the major inadequacies noted, degree of cooperation, and need for a revisit is useful.

### The Approach

Before fieldwork is begun, letters to X-ray machine owners describing the program and,

preferably, expressing the endorsement of the appropriate professional society are useful. This step was taken in Oregon, and each user, not his secretary or nurse, was also called on the telephone and asked for a specific appointment. Time was taken to explain concisely the goals of the program, always with the attitude that the practitioner is a professional person who wishes to fulfill his responsibility in regard to radiation hazards. Our experience demonstrated that, when approached in this manner, the vast majority of practitioners will agree to a review of their X-ray units.

Endorsement of the program by the medical leaders in the community is important in obtaining active cooperation of the practitioners. The policy in Oregon has been to visit first the radiologists and larger hospitals. Grapevine information about the X-ray surveys is always widespread and can be helpful or harmful.

If possible, appointments for visits should be scheduled several days in advance to allow flexibility in regard to crowded practice hours, afternoons off, or prior commitments. A field staff of four needs perhaps half a day in a community for, say, 12 to 16 surveys. Using forms, we have found it possible to complete an inspection and report in an hour.

The typical medical or dental practitioner or veterinarian has had little formal training in taking and processing X-rays. Usually he has acquired his knowledge through experience, based perhaps on instructions supplied by X-ray distributors. Such instructions may or may not consider protection from radiation. X-ray technicians vary greatly in training and experience. Registered technicians usually have had hospital radiology department training and understand their work quite well, but even they should not be expected to know, for example, the implications of underdevelopment of films or increased kilovoltage in relation to exposure. The usual technician is office-trained by the physician and X-ray distributor, and many of them rely on prepared charts of exposure without understanding basic principles.

We have prepared a clearly written statement of the essentials of radiological protection which is left with each practitioner (in addition to the checked recommendation form), and explanations are provided while the standard

Since radiographic exposures occur in short pulses of comparatively high readings (in milliroentgens per hour), it is usually not practical to assess resulting hazards with a survey meter. We especially discourage any such time-consuming procedures as plotting isodose curves near a unit. Past experience allows one to judge protection with considerable accuracy, and, of course, film badges must provide the final proof. Since reports are written at once, we rely on past experience in making recommendations without waiting for the results of film badge surveys. If there is doubt as to what the film badges will show, we write several alternative recommendations with instructions on how to interpret the film badge results, and usually schedule a revisit.

During surveys of fluoroscopes, we record the dose rate through the leaded viewing screen and at waist height near the unit. Values in excess of about 20 mr per hour for the former and 1,000 mr per hour for the latter may require special attention if the workload in minutes of fluoroscopic viewing per week is sufficiently high. Most readings observed in Oregon, as well as those reported in the literature (11), have been below these values.

Dental X-ray units may pose some difficult problems in personnel protection. Because of space limitations and a desire to watch the patient during X-ray, many dentists consider protective shielding awkward. For small case-loads, not more than 10 to 20 dental X-rays a week, experience indicates that a long timer cord on the unit, allowing the technician to stand 7 to 10 feet away, may be adequate protection, provided there is a good tube head and careful use. A recent report shows that dental exposure rarely exceeds 300 mr per week even in offices with minimal or no protection (8). An adjacent thick plaster wall which usually provides an attenuation factor of 2 to 6, may serve as shielding. Much depends on the design of the X-ray unit.

For heavier workloads, we recommend installation of a shielding device. Special attention is given to making this convenient. A hinged, leaded plywood sheet may be attached to a wall, for example, or shielding may be built onto an existing partition. Few dentists today hold films in their hands during exposure, although

cases of chronic radiodermatitis have been seen as the result of such practices in the past. For dental X-ray units, as for all others, the personnel exposure should be documented, and the suggestions made should take cognizance of individual needs.

### Patient Exposure Reduction

Personnel exposure and patient exposure present quite different protective demands, and the distinction should be pointed out during surveys. Since one is often called on to discuss possible hazards of radiation exposure, all individuals conducting the survey should receive instruction on such subjects as genetic damage, leukemia, skin burns, and damage to embryos during pregnancy. Many moderate, carefully documented statements on these subjects are available (3,5). The information given to practitioners and technicians must be based on sound facts if confidence in the program is to be established.

Regardless of what specific conclusions are reached regarding the hazards mentioned above, and we feel the hazards should be put into the reasonable context of the numerous health hazards encountered in everyday living, one can state without equivocation that the changes the Oregon Board of Health recommends reduce patient exposures associated with needed X-rays by some 50 to 95 percent without sacrifice of X-ray quality. If this is understood, one need not argue about the possible deleterious effects of a given exposure or make the avoidance of X-rays a prime recommendation. Any substantial likelihood of harm justifies using the necessary protection techniques if they do not interfere with the advantageous use of X-ray. The Oregon program does, of course, try to discourage unnecessary or unusually hazardous procedures, such as spino-grams, shoe-fitting X-ray, well-baby fluoroscopy, routine pelvimetry in pregnant women, and routine examinations that cause heavy gonadal exposure, such as pre-employment examinations of the lower back.

Present standards for total population exposure to radiation are based on genetic considerations. In other words, genetic damage is thought to be the major limiting factor to



surveying fluoroscopes. The standard kit of instruments used by the Oregon Health Department, shown in figure 1, consists of a "cutie pie" ionization dose rate instrument and a condenser r meter. The instruments should be checked for accuracy in the energy region of soft X-rays before a final choice is made.

### Personnel Protection Devices

In offices with small caseloads, special personnel protection devices may not be necessary, depending on attenuation by the tube head, design of the office, and work habits of the technician. Exposure should be documented in all instances, however. We usually suggest some sort of protective device to reassure the technician and provide legal protection for the owner, but on this question, as on others, judgment as to the hazards is a ruling factor. Rigid application of protection rules without consideration of the particular situation may lead to unnecessary difficulties.

In offices with a normal to heavy workload, a leaded barrier is recommended. It need not be expensive, since a lead sheet or lead-faced plywood can be purchased and installed by the owner (9). The field staff can easily learn where such materials are available locally, how much they cost, and how to install them. (This information should also be provided in the notes given each X-ray owner.)

Enclosed leaded cubicles are hardly ever mandatory in diagnostic work, although they are often found today in the larger hospitals. With adequate structural material in the walls, experience indicates that lead shielding in the walls of the radiographic room is needed only if there is an exceptionally heavy workload and permanent occupancy in adjacent rooms. However, lead is often needed behind the cassette holder used for chest and upright X-rays if the beam points into the waiting room or other occupied areas. Outside brick walls or distance often reduce the radiation exposure in the vicinity to small proportions. However, any possible exposure, including that in adjacent offices of the same building, should be documented.

Exposure of the practitioner himself may pose special problems. There are still some

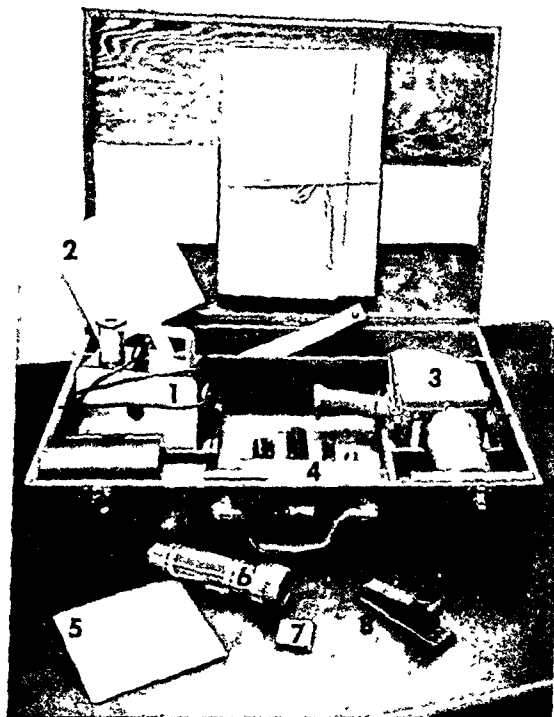


Figure 1. X-ray survey kit used by the Oregon Health Department

1. Charging and reading unit for air-equivalent wall ionization chambers.
2. Ruled fluorescent grid for determining dental X-ray beam size and symmetry.
3. Ionization dose rate instrument.
4. Air-equivalent wall chambers.
5. Aluminum sheet for half-value layer determinations.
6. Flashlight.
7. Tape measure.
8. Stapler.

physicians who do not wear lead aprons and gloves in fluoroscopy or who use excessively old or cracked aprons. Small cracks or holes in aprons are not usually important, but, of course, they should be avoided when feasible. A recent review by Hale (10) discusses other fluoroscope monitoring problems. X-ray work in operating rooms, especially in genitourinary surgery, may lead to exposure because the surgeon, normally in a sterile gown, is reluctant to go behind shielding, even if it is present. However, most such exposures are limited and the hazard is not large, provided the physician stays away from the primary X-ray beam. A film badge check of all operating room personnel is advised if such work is at all usual.

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Present standards for total population exposure to radiation are based on genetic considerations. In other words, genetic damage is thought to be the major limiting factor to

the use of radiation. Exposure of parts of the body other than the gonads may present some hazard in regard to leukemia, for example, but it is not thought at present to be a major consideration in ordinary diagnostic work. An exception is exposure of the fetus during pregnancy. There is some evidence that exposures of pregnant women to radiation may lead to an increased incidence of leukemia in the offspring and also that the mammalian embryonic nervous system is sensitive to radiation (2). It seems prudent to avoid radiography involving the abdomen of pregnant women that is not urgently needed. Some obstetricians estimate that not more than 5 percent of pregnant women need an abdominal radiograph.

### **Coning and Local Shielding**

To prevent genetic defects produced by radiation, primary attention is given to protecting gonads from the direct beam whenever possible. Coning of the X-ray beam and gonadal shielding are the two main techniques for this purpose, and both present complex problems.

In principle, "coning" of the X-ray beam can provide good gonadal protection. Various devices are in use for confining the beam, the commonest being a metal cone attached to the tube head. Frequently, a cone of a single size is used for X-raying small fields, such as the gall bladder or sinuses, but no provision is made for limiting beam size when larger fields must be exposed. Another device in use is a lead diaphragm fitted into the tube housing. Sets of such diaphragms cut to required sizes for various fields are available in some localities. Cones and diaphragms, to be effective, have to be accurately tailored to the particular X-ray head and field sizes and used appropriately. A single cone or diaphragm cannot provide adequate protection. As a minimum, two different cones are needed for 14-inch by 17-inch films at 72 inches and 36 inches, and an additional narrow cone must be used for small fields. However, the narrow cone, known as a "sinus" cone, may also happen to suffice for 14-inch by 17-inch fields at 72 inches. The surveyor must have a clear mental picture of the geometry of X-rays and needs to know how to locate the position of the anode on the tube housing

(usually indicated by a red spot). We usually carry a small slide rule to facilitate computations.

The following are examples of situations we have encountered in connection with beam collimation. Two or three cones are present but all are too large for the field sizes used. Cones are present, but the technician does not use them. The practitioner is willing to get one or two more cones, but the correct sizes are not commercially available. The practitioner is reluctant to spend some \$20 apiece for new cones. There is little use of available diaphragms, although sets of four or more may be on hand, labeled according to field size and use.

A more fundamental problem is that properly chosen cones allow little margin, and poor centering of the machine leads to cutoffs on films, producing some annoyance and a need for retakes. Although many radiologists may not object to slightly cut corners, others are unwilling to accept them, with the result that the cones are not used.

A variable aperture collimator offers a way out of this difficulty. Essentially, a variable aperture collimator is a continuously adjustable round or rectangular lead diaphragm, which can be set conveniently for any given field size and distance combination. A centering light or light beam is provided to facilitate positioning. A small model sells for about \$100, and better units up to \$450. We have recommended purchase of variable aperture collimators when it appeared that the practitioner would be interested. However, even adjustable collimators pose some difficulties. They must be precisely attached to the tube housing in order to produce a symmetrically centered field. Put on carelessly, they can also cause cutoffs, which force the technician to set them at a somewhat larger field size than indicated, to that extent decreasing their protective functions. Also, some of these collimators have a built-in extra beam size margin of 1 to 2 inches in all directions, which is probably necessary if one aligns with a central light spot. Several adjustable cones have been manufactured that project the entire field rather than one central spot. They should be very satisfactory, provided the light and X-ray beams are accurately centered with respect to each other.

The radiation-safety aspects of an ordinary P-A chest X-ray illustrates these problems further. One would hope to limit the beam sufficiently to protect the ovaries in the female. If a round metal cone is used, it must be checked first for proper size, using the diagonal measurement of the 14-inch by 17-inch film and about a 2-inch margin in each direction to give a final diameter of roughly 24 to 25 inches. In order to get an accurate field, the cone itself must be tailored to less than one-fourth inch in critical diameter. The necessary wide choice of cones is not usually available. If a circular field is used, its lowest portion will extend well down into the gonadal area of a woman, though the male gonads would be excluded. Rectangular cones (nonadjustable) are not widely available at present. If diaphragms are used (most machines are not equipped for them), the utmost precision is required in computing and cutting out the apertures. Because of lack of standardization on units of different ages and manufacturers, diaphragms must be practically tailor-made for the unit. If a variable aperture collimator is used, it must not allow excessive margins, and it must be accurately centered.

These complications are mentioned because it should be well understood by the field staff that the mere presence of one or even four cones does not assure good coning.

Accurate coning, of course, is more important in certain projections than others. For a film of the foot or ankle, almost any cone will protect the reproductive organs from the primary beam. In abdominal or lower back X-rays, it is difficult with cones alone to exclude the gonads from the beam.

Because of the practical difficulties in achieving adequate coning, we recommend gonadal shielding as a supplement to coning. Considerable overt resistance to local shielding has been encountered in the field. Some practitioners (and technicians) feel it will alarm patients. Local shielding may be a nuisance. For upright projections, as of the chest, rather cumbersome aprons or externally supported shields are sometimes necessary. A variety of gonadal shields are on the market, including leaded bivalved arrangements for the scrotum, but these involve hygienic and aesthetic considerations.

With radiography of the abdomen, the pelvis, the hips, or the lower spine, considerable care and ingenuity are needed if protection of the gonads is to be achieved by shielding. Various shaped pieces of lead are needed, for example, for protection of the ovaries during abdominal work, shielding of the scrotum or ovaries in infants being checked for congenital dislocations of the hips, or protection of the ovaries and fetal gonads during pelvimetry. Shields made of leaded glass woven material can be used but are low in lead equivalence and are expensive. Descriptions of specialized shielding devices are found in the literature (12-14), and one's imagination is the only limitation for suggesting new arrangements. For routine chest X-rays externally supported shielding is probably necessary if large round cones are used. Few X-ray users surveyed in Oregon have taken the steps necessary to curtail gonadal exposure in examinations of the critical lower trunk area. A useful technique for local shielding is the mounting of lead sheet on a larger clear plastic sheet, which can be positioned over the patient accurately and easily.

In photofluorographic (p.f.g.) work (in chest X-ray vans, for example) limitation of beam size is often more nearly satisfactory because precise diaphragms can be cut and permanently installed. We advise checking the actual field size projected with X-ray films or fluorescent materials. Usually the film-carrying hood assembly is coupled automatically to the X-ray head. Therefore, no centering problem arises, and small margins are possible, especially on the bottom edge. For photofluorographic work improved lens systems, fast screens, and fast film help to reduce the dose. The film used in p.f.g. units differs in size from ordinary X-ray film and is not necessarily available in the same range of speeds.

Limitation of beam size for dental X-ray units can be readily accomplished. Most dental units, however, have unnecessarily large beams although there is a plastic pointer on the outside, and a lead washer may even be installed inside it. Standards for dental radiography have been discussed in several articles (15-18). A 2¾-inch field diameter at the patient's jaw is advised. A 16-inch tube-to-skin distance is preferable to reduce parallax errors, but S

inches is much more commonly used. Restriction of beam size is easily achieved by inserting a heavy lead "washer" inside the plastic pointer cone, of a size calculated to produce the recommended field diameter. Such washers, together with filters, are becoming widely available commercially, or they can be fabricated at minimal expense. We do not feel additional local shielding is indicated for general dental work.

### **Added Filtration**

Another step that reduces patient exposure is the insertion of an aluminum filter into the X-ray beam (19). The filter cuts out the soft component of the X-ray beam, which otherwise would irradiate the soft tissues closer to the X-ray tube but would not contribute significantly to the actual X-ray image on the film. Current standards require a total filtration of 2.5 mm. of aluminum equivalent on radiographic units. Most X-ray tubes have an inherent filtration of about 0.5 mm., and therefore only 2 mm. of aluminum need be added. Some tubes have a substantially higher inherent filtration, up to 1.5 mm. We use a table listing inherent filtration for various machines, but when in doubt the assumption of 0.5 mm. is unlikely to cause difficulty. Provided a unit is used at kilovoltages higher than about 70, no change in exposure is required on insertion of 2 mm. of added filter, even where none was used before. At lower kilovoltages some small increase in milliamperage and time of exposure may be necessary. Many dental units operate at 55 to 65 kv. and with these the addition of 2 mm. of aluminum may cut down output to a level where exposure time becomes excessive. The current NCRP recommendations for dental machines call for total filtration equivalent to 1.5 mm. of aluminum. Most new units include the required permanent filters.

### **Film and Film Development**

Film, film development, and film cassettes are comparatively simple components of radiological control. The usual X-ray film cassette contains two intensifying screens, one on each side of the X-ray film. Only when very fine detail is required (as in certain bones) should

film be used without such screens. Therefore, the effective exposure speed depends both on the film emulsion and on the cassette screens.

In recent years films have been substantially improved and several excellent fast films are on the market. The price is perhaps 10 percent more than for standard-speed film, but this should not deter their use. The fastest films may show slightly less detail, and radiologists may not find them entirely satisfactory for critical work. However, they are adequate for many purposes and can be expected to decrease patient exposure by 30 to 40 percent.

Cassette screens have also been improved. A pair of 14-inch by 17-inch cassette screens cost about \$30, in part because of the high standards of uniformity that are needed to prevent the production of spurious shadows on the films. Replacement of screens in all 6 to 10 cassettes used in an office is therefore expensive. Installation of fast screens in only one cassette is possible in a small office, but then two different exposure techniques have to be used. The reduction of patient exposure with newer screens is about 30 percent. An optimum combination of screen and film promises even greater reductions, and specifically matched sets will doubtless become available soon.

Experience in the Oregon survey has revealed that a majority of X-ray films are not properly processed. In order to utilize the full speed of the emulsion the film must be fully developed, which means 5 minutes at 68° F. Some film manufacturers offer charts giving times for "standard" development and "full" development. There appears little question that 5 minutes can and should be allocated to developing the film, even in an emergency. However, as with any photographic emulsion, the temperature of the developer is a critical factor in the chemical process. Full development may be obtained at 75° F. in less than 3 minutes, but with some increase in grain size and fogging. Most smaller offices have no thermostatic baths, and many technicians control developer temperature by trial and error, using surrounding sink water with fair results. Others do not watch the temperature at all and control density by inspection, which is not desirable. Small electrical bath thermostats are not expensive

and ought to be recommended in practically all offices.

To produce a satisfactory film with a development time of only  $2\frac{1}{2}$  to 3 minutes at  $68^{\circ}$  F. requires approximately a 50 percent increase in exposure. If full development, fast film, and other innovations are used, exposure time and milliamperage used in the tube, or both of these, may be decreased. Usually a multiplication factor for the combined changes can be established by trial and error for some representative exposure and then applied "across the board." It is possible at times simply to decrease exposure while obtaining good results, because X-ray film has some considerable exposure latitude.

### Increasing Kilovoltage

A number of articles have appeared on the advantages of high kilovoltage in X-ray work (19-21). Simply put, the kilovoltage determines the velocity of each electron while the tube current (in milliamperes) is proportional to the number of photons per unit time. The total exposure is therefore measured in milliamperes-seconds (MAS); it is proportional to the total number of photons reaching the patient. A change in tube kilovoltage has a complex effect, since it both increases the number and energy of photons. In practice a rule of thumb is that the MAS should be halved for each increase of 10 kilovolts. The advantage of higher kilovoltage is that the resulting beam is more uniform and penetrating. This increases the ratio of useful negative image to patient exposure.

Radiologists have generally considered high kilovoltage to be above 100 kilovolts. An objection has been raised that at values of 100-120 kilovolts the films have lower contrasts and are harder to read. However, radiologists who take time to get used to the "greyer" high-kilovoltage films find them completely satisfactory and often superior in range of detail. Most units in use, however, are not designed to operate at high kilovoltage. Some units may show a scale up to 110-120 kilovolts, but are not necessarily intended for heavy usage above 100 kilovolts, unless of recent design. For instance, the conventional high-voltage cables found on most

smaller units are said to fail rapidly at levels above 100 kilovolts. On the other hand, much work today is still done in the 60-75 range, which is less than satisfactory in producing a full range of detail. We recommend the use of the 75-90 kilovoltage range for the ordinary nonhospital installation, which affords a compromise between maximum reduction of patient exposure and practical demands.

When higher kilovoltage technique is adopted, the exposure charts must be extensively modified. Since modification is a complex undertaking, it is advisable to get a ready-made high-kilovoltage chart from an X-ray distributor. This can then be adapted to the given unit by a simple proportionality factor.

The radiological surveyor needs to know which distributors have charts and to study them himself so as to provide correct advice. Changing from 65 to 85 kilovolts results in substantial reductions in entrance skin exposures (by as much as 75 percent) with somewhat lesser reductions deep in the body.

Considerable time goes into explaining why higher kilovoltages are recommended since most technicians find this contrary to what they expect. Radiologists (and hospitals) commonly use medium-high kilovoltages and time and effort expended in encouraging them to go higher may be fruitful. Since radiologists are specialists in this field, some restraint is advisable in insisting that they alter their working technique. On the other hand, many of them have not given the high-kilovoltage technique a fair trial and may be encouraged to do so.

Since most dental units operate at a low, fixed kilovoltage in the order of 55-70 kilovolts, no major change in voltage is possible unless the unit is replaced. The newest dental units are adjustable and go up to 90 kilovolts.

The installations in use by chiropractors, osteopaths, veterinarians, and others are frequently, though not necessarily, old and of low maximum kilovoltage and current output. Replacement may often be advisable. However, it should be noted that kilovoltage is only one factor among many, such as filtration and film speed, and the vast majority of units in use can be put into acceptable condition though at lower than optimum kilovoltage.

We have encountered only a small number of really obsolete machines in Oregon, such as those with exposed wiring or bivalve tube shields without a full housing. These units are hazardous with respect to electrical shock alone. The surveyor should have a general idea of what new and good used X-ray machines cost and keep these figures in mind when discussing replacement. If replacement at a future date is decided upon, the practitioner nonetheless may still need to install protective items on his current equipment, since the purchase may be put off for years.

### Dose Rate Measurements

A word may be said here about taking measurements of dose rate in the direct X-ray beam. We do not routinely measure dose rate in the X-ray beam except in fluoroscopic installations for the following reasons: many instruments do not read accurately with short pulses; making a full set of measurements with a condenser r meter is much too time consuming; and, most important, such measurements are really not needed to assure protection. The X-ray film itself serves as a final dosimeter for any exposure. Therefore, if a filter is present, if the kilovoltage is adequate, and if fast film is used and processed fully, the skin exposure for a given high-quality X-ray negative can be accurately predicted. While the output of machines at a given kilovoltage and milliamperage varies greatly when there is no filtration, much less unpredictability is found if the routine protective devices are present.

Many units in the field are of the convertible type, that is, the radiographic head swings under the table and is locked into position to produce a small fluoroscopic installation. For these, much information about the fluoroscopic output is already at hand after the standard inspection. Larger installations have separate fluoroscopes which require a separate survey. Frequently it is difficult to examine adequately the fluoroscopic tube head for filtration, and we therefore routinely obtain a half-value layer measurement as well as fluoroscopic dose rate in air. The half-value layer is that thickness of a given material which reduces the beam intensity by one-half. It is convenient

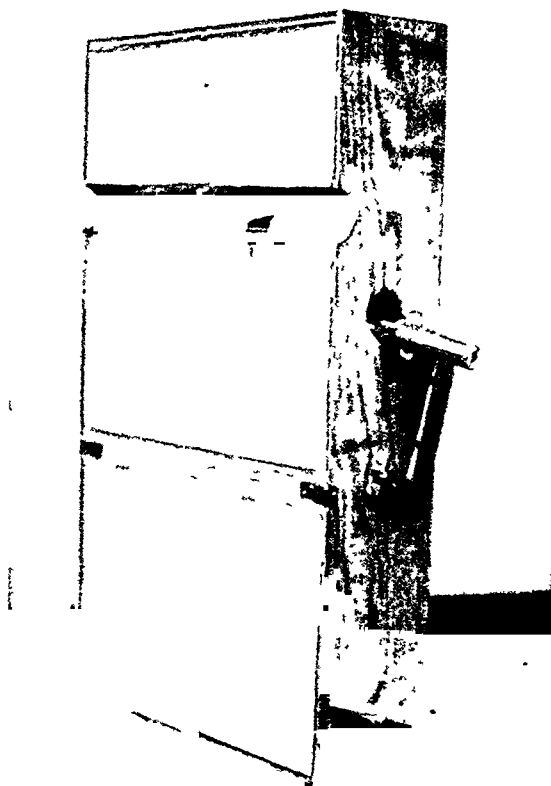


Figure 2. Paraffin phantom for measuring scatter radiation and depth dose

to use a 1 millimeter thickness of aluminum (pure, not alloyed) and take measurements with two suitable (5 and 10 r capacity) condenser r chambers simultaneously. Trout and associates (19) provide charts of the effective half-value layer equivalents of X-ray beams with a given kilovoltage and total filtration. Under ordinary conditions, 2.5 mm. of total tube filtration results in an X-ray beam that is further attenuated about 25 percent by an additional added millimeter of aluminum; that is, the measured dose in air and through the standard aluminum sheet (directly on the tabletop) should not differ by more than 25 percent. It is suggested that the proper values for a given instrument, filter standard, and so on, be checked empirically when a program is set up, using hospital units with a known total filtration. Somewhat more precise half-value layer measurements can be obtained with special metal caps over a condenser r chamber (10). Inaccuracies resulting from using the

chambers directly on the table rather than in a scattering medium are not very important in routine fieldwork.

Measurements of secondary radiation, however, should preferably be made with a scattering medium in the X-ray beam. Lateral dose rate at a fluoroscopic table is at least doubled by a scattering mass as large as the human body. A block of paraffin or stack of masonite sheets will serve this purpose. Measurements of semiresearch quality can be obtained by a standard paraffin block with openings at the surface and deeper channels for measurements equivalent to various depth doses. Figure 2 illustrates such a block. Aluminum sheet for half-value layer determination can be built into the block. It is then possible to get three or four useful measurements from a single exposure quickly and efficiently. If such a "phantom" is used for radiographic as well as fluoroscopic studies, special care should be taken to avoid saturating the chambers with excessively short and intense pulses of radiation.

Another basic fact concerning measurements is that even though the X-ray beam may be sharply limited by a cone, the secondary electronic equilibrium built up in any scattering mass, including the human body, extends appreciably beyond the original limits of the beam (22). Scatter measurements in a paraffin block taken, for example, 4 inches beyond what is thought to be the actual edge of the beam will be much higher than more distant scatter measurements. This point is also of importance in connection with recommendations about local shielding. For instance, any attempt to shield the ovaries with a pair of 2-inch diameter lead sheets on a plastic sheet would probably result in only a small decrease in actual radiation exposure of the ovaries because of the electronic equilibrium conditions built up deep in the body.

### Special Techniques for Fluoroscopes

The present NCRP limit on fluoroscopic dose rate at the tabletop or panel is 10 r per minute in air (23). Judging by comments from local radiologists 5 r per minute is adequate for observations, and not infrequently 1 to 3 r per

minute may be practical. Milliamperage settings to achieve these dose rates run on the order of 1.5 to 3.5; but milliamperage meters are often inaccurate and should not be relied on. To fluoroscope successfully below 5 r per minute, 15 to 20 minutes of dark adaptation is recommended; even 10 minutes improves vision materially. Unless the fluoroscopic room is completely dark, light leaks may interfere with viewing. Red goggles for dark adaptation are owned by many but used by far too few. Low-efficiency screens used with some older fluoroscopic units should be replaced.

When the fluoroscopic viewing screen is examined for shutter adequacy, a dark margin should be found on the screen with the shutters wide open. However, this specification depends on the distance from the tabletop at which the screen is used, and judgment is therefore exercised in placing the screen for this test. Twelve to fifteen inches seems realistic, but perhaps a greater distance is safer. The residual dose rate through the leaded-glass fluoroscopic screen under normal conditions is commonly 5-20 mr per hour. Rates above this require investigation (10).

High rates may sometimes be due to a failure to readjust kilovoltage to the usual fluoroscopic kilovoltage; this, of course, also increases the dose rate in air. Several scatter measurements can be made in the vicinity of the unit, preferably with a scattering block in place. Rates at the sides of the unit are often 250 to 1,000 mr per hour, rising to as high as 1,500 mr per hour at certain locations above the table but not in the direct beam. While these values are high, it should be noted that few units are used for as much as an hour a week, except in hospitals, and also that the user is expected to be wearing protective garments. Some also employ lead hangers at the fluoroscopic assembly and to cover the Bucky slot. The fluoroscopist's forearms may be exposed to more than 300 mr a week, but this is below exposure limits for the hands and wrists of 1.5 r a week. Normally the shutters are at least partly closed during actual use. Film badges should be the court of final appeal. They should be used inside the apron and possibly on the collar and coat sleeves.

An additional NCRP specification for fluoro-



scopes is a minimum distance of 12 inches and a preferred distance of 18 inches from tube target to panel or tabletop. We have found that most units fall somewhere between these measures. The reason for this specification is rather complex, involving differences in effective dose rate at varying depths in the body, as influenced by the inverse square law. Some recent actual measurements suggest, however, that the dose at minimal distances is not too great (10), and we believe considered judgment, with cognizance of measured dose rate, should govern suggestions for rebuilding a unit. It should be clearly understood that the point at issue here is not simply dose rate as a function of distance, but a much more involved physical phenomenon.

Among various specialized types of fluoroscopic installations, a common one is the upright unit used by internists for quick inspections of the heart and lungs. Since the fluoroscopic unit does not tilt to the horizontal position, it is practical to tape up the chambers and half-value layer filter with wide adhesive tape. The controls on such units often show transformer primary (line) voltage rather than secondary voltage actually impressed on the X-ray tube, and it is therefore often impossible to assess operating kilovoltage. However, this is immaterial as long as dose rate and half-value layer are known and adequate.

Fluoroscopic units in pediatric clinics require careful scrutiny. It is easily possible to deliver as much as 10 r to the gonads and much of the body of an infant in a single fluoroscopy examination if the exposed field is not well collimated. If every infant received such a dose, the gonadal limit of 10 r for the total population by age 30 would be exceeded (1). Many authorities have strongly urged decreased use of pediatric fluoroscopes, and we have found it possible to persuade many physicians to agree, although a few pediatricians wish to have the unit available for emergency work, to locate foreign bodies, for example. If the unit is used, it is clear that low milliamperage and adequate filtration and shutters should be present for protection. In some instances a lead sheet (2½ pounds per square foot) with a small rectangular cutout somewhat smaller than the usual infant chest is permanently mounted on

the tabletop in place of shutters. Pediatric units unfortunately are frequently found to be converted X-ray units without shutters. The pediatricians always welcome information about the dose rate of a unit and a discussion of the current concepts of gonadal and other exposure limits.

Most osteopaths and chiropractors in Oregon disclaim substantial use of fluoroscopy. However, their units, usually those of the convertible type, are checked for fluoroscopic output. Some hospitals have portable units and use is made of a hand-held fluoroscope. These devices are rapidly disappearing, as their use is condemned today.

If a unit owned by a chiropractor is used for spinograms, special collimating diaphragms with a slot-shaped aperture and the use of special gonadal shielding will at least reduce the dose. Most of the chiropractic units we have encountered have been older units of small output. Under these conditions the exposures required for penetration of the spine and pelvis run into many seconds; further reduction of output by filtration may extend this time. Since chiropractic work involves X-raying thick parts with potentially high gonadal exposures, the burden of justification is on the prescriber. As noted above, the State considers the dose unnecessary and actively discourages the use of spinograms.

### Summary and Conclusions

Highly trained personnel are sought for inspection of diagnostic X-ray units. This work requires considerable specialized knowledge of X-ray technique, radiation measurements, personnel exposure standards, and radiobiological effects. The chief of such a program has to answer questions relating to radiological hazards, and it is advisable for him to have formal postgraduate training in radiobiology. The working team requires specific field instruction under the guidance of the program chief.

Occupational X-ray exposure appears to be fairly well under control; few gross overexposures are found. Film badges are suggested wherever personnel monitoring is required, but not necessarily for use continuously. Experience is often more reliable for judging personnel exposures than survey instruments.

Collimation of the X-ray beam is probably the most important single factor in reducing patient exposure. Adequate coning is difficult to attain in practice. Fairly good results can be obtained with some types of variable aperture collimators, particularly if they completely illuminate the field with visible light. Gonadal shielding is recommended for all examinations involving the lower trunk, however, as an additional precaution.

Additional protective techniques readily applicable to most units include added filtration, fast film, full-film processing, and correct exposures. To these may be added under some circumstances fast cassette screens and high-kilovoltage technique.

Fluoroscopic output can be reduced at the tabletop or panel to 5 r a minute or less without much difficulty. Personnel exposure in fluoroscopic examinations is not excessive if the usual protective garments are worn.

Pediatric fluoroscopes and chiropractic installations used for spinograms are discouraged.

For good results, persons in radiation safety programs dealing with diagnostic X-ray units need a detailed understanding of X-ray work, both from the theoretical and practical viewpoint. They must also be familiar with the complex current exposure standards and with diagnostic radiology. One cannot depend on simply recommending that "adequate coning be provided," for instance, if success is to be expected. Specific advice is demanded on all details of accomplishing the desired improvements. For this purpose, special instruction forms and explanatory materials for owners and operators are a useful supplement to counsel and surveillance.

Information concerning the Public Health Service inspection programs and training courses can be obtained by writing to the Division of Radiological Health, Public Health Service, Washington 25, D.C. Copies of inspection forms used in Oregon can be obtained by writing to the Oregon State Board of Health, Portland 1, Oreg.

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# A Food Poisoning Outbreak Aboard a Common Carrier

CHARLES J. HART, M.P.H., WADE W. SHERWOOD, M.D., and ELIZABETH WILSON, Ph.D.

**I**N the spring of 1959, a special railway train carrying visitors to a national conference was the source of one of the largest outbreaks of food poisoning on record in this country. Of 450 passengers aboard nearly half were affected, 25 of whom required hospitalization.

An interesting element of the event was that investigators found a clue which may lead to a new line of investigation, and so may enable health officials to identify agents of food poisoning outbreaks which usually are reported with "origin unknown."

Two meals were served aboard the special train during the overnight trip—a cafeteria-style dinner served between 6:00 p.m. and 8:00 p.m., and breakfast between 4:00 a.m. and 6:30 a.m. However, the breakfast meal was not suspected, since the peak of the outbreak had

been reached before breakfast was served, and many of the victims did not partake of it. The dinner meal consisted of roast turkey, dressing, gravy, cranberry sauce, mashed potatoes, green peas, bread, butter, ice cream sundae, and coffee (with or without cream), tea, or milk. Since there was no separate charge for the meal, the same menu was served each passenger. Passengers from one coach at a time went to the dining car for their food and then returned to their coaches to eat it.

During the night, some of the passengers experienced episodes of acute gastroenteritis, the number reaching a peak after 1:00 a.m. The distribution of 181 of the cases by onset time is shown in the graph. The onset time for seven additional cases is unknown. The frequency of symptoms reported by the 188 persons with gastroenteritis is shown below:

Symptoms	Number of patients	Percent of patients
Stomach cramps-----	164	87.3
Diarrhea-----	163	86.7
Headache-----	94	50.0
Nausea-----	92	48.9
Chills-----	54	28.7
Vomiting-----	46	24.4
Feverishness-----	40	21.2
Sore throat-----	20	10.6
Other-----	23	12.2

It appeared that the syndrome consisted primarily of severe abdominal cramps and watery diarrhea with nausea and vomiting less prominent. Nearly all the patients had improved within 12 hours and, although distressing to the patient, the illness appeared to be

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*Consultation and laboratory studies on the cultures of Clostridium perfringens were provided by Dr. Howard E. Noyes, Walter Reed Army Institute of Research, Washington, D.C., and Dr. Betty C. Hobbs, Central Public Health Laboratory, London, England. Laboratory assistance was provided by Matthew Fusillo, D.C. General Hospital; Dr. David L. Rogers, Communicable Disease Center; and Dr. Keith H. Lewis and Dr. Milton J. Foter, Robert A. Taft Sanitary Engineering Center.*

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# Occupational Health Notes

## Carbon Tetrachloride Poisoning

In Tennessee a worker brushing a bonding agent on metal plates to hold a rubber mat developed acute nephrosis. Samples from the worker's breathing zone showed concentrations of carbon tetrachloride and xylene above the maximum allowable concentration.

## Sawdust Trail

A dust explosion and fire recently destroyed the cyclone collector and sawdust bin of a hardwood flooring company at Everett, Pa. Apparently, the explosion and blaze resulted from overheated sawdust on rafters in the boilerroom adjacent to the dustbin and cyclone collector. Rafters which supported the boilerroom ran through the common wall and across the dustbin. There was no solid wall between the dustbin and boilerroom. Ignited dust on the rafters above the boiler burned in a slow trail to the dustbin where the explosion occurred.

It is customary for lumber plants to collect sawdust in a cyclone and dustbin, and to burn it in the boiler. For safety, it is recommended that a solid firewall separate dust collection units and boilerroom; that dust be prevented from accumulating on rafters above the boiler; and that firing the

boiler with sawdust be done with care to prevent a backflash. It is also good practice to keep the fire-door between dustbin and boilerroom closed except to remove sawdust for burning and to keep flammable material away from the boiler and sawdust bin. Without such precautions, a dust collector and a boiler are potential dynamite.

—W. C. MAWHINNEY, industrial hygienist, Pennsylvania Department of Health.

## Celery Workers' Rash

Pink rot, a fungal disease of celery, causes a skin rash among cutters who handle celery before it is washed in the packing sheds. Most frequently the cutters complain of blisters which break and develop into a depigmented type of lesion, but the disease can also cause hyperpigmentation. The hyper- or hypopigmentation may last for 9 months.

At the request of the Michigan Department of Health, the Occupational Health Branch, Bureau of State Services, Public Health Service, studied the dermatitis among workers on 15 farms in that State. Patch tests on celery workers and volunteers at the Occupational Health Field Headquarters indicate that the cause of the rash is photosensitization of pinkrot-diseased celery.

## Exposure to Microwaves

Experience and research have not indicated a need to change the present standard, 10 milliwatts per square centimeter, of a safe working exposure to microwaves, it was reported at the Third Tri-Service Conference on the Biological Effects of Microwaves held at Berkeley, Calif., August 27-29, 1959.

# A Food Poisoning Outbreak Aboard a Common Carrier

CHARLES J. HART, M.P.H., WADE W. SHERWOOD, M.D., and ELIZABETH WILSON, Ph.D.

IN the spring of 1959, a special railway train carrying visitors to a national conference was the source of one of the largest outbreaks of food poisoning on record in this country. Of 450 passengers aboard nearly half were affected, 25 of whom required hospitalization.

An interesting element of the event was that investigators found a clue which may lead to a new line of investigation, and so may enable health officials to identify agents of food poisoning outbreaks which usually are reported with "origin unknown."

Two meals were served aboard the special train during the overnight trip—a cafeteria-style dinner served between 6:00 p.m. and 8:00 p.m., and breakfast between 4:00 a.m. and 6:30 a.m. However, the breakfast meal was not suspected, since the peak of the outbreak had

been reached before breakfast was served, and many of the victims did not partake of it. The dinner meal consisted of roast turkey, dressing, gravy, cranberry sauce, mashed potatoes, green peas, bread, butter, ice cream sundae, and coffee (with or without cream), tea, or milk. Since there was no separate charge for the meal, the same menu was served each passenger. Passengers from one coach at a time went to the dining car for their food and then returned to their coaches to eat it.

During the night, some of the passengers experienced episodes of acute gastroenteritis, the number reaching a peak after 1:00 a.m. The distribution of 181 of the cases by onset time is shown in the graph. The onset time for seven additional cases is unknown. The frequency of symptoms reported by the 188 persons with gastroenteritis is shown below:

*The authors are with the Public Health Service. Mr. Hart is a sanitation consultant with the General Engineering Branch, Division of Engineering Services; Dr. Sherwood is an epidemic intelligence service officer with the Communicable Disease Center, Atlanta, Ga.; and Dr. Wilson is a bacteriologist with the Milk and Food Research Branch, Robert A. Taft Sanitary Engineering Center, Cincinnati, Ohio.*

*Consultation and laboratory studies on the cultures of Clostridium perfringens were provided by Dr. Howard E. Noyes, Walter Reed Army Institute of Research, Washington, D.C., and Dr. Betty C. Hobbs, Central Public Health Laboratory, London, England. Laboratory assistance was provided by Matthew Fusillo, D.C. General Hospital; Dr. David L. Rogers, Communicable Disease Center; and Dr. Keith H. Lewis and Dr. Milton J. Foter, Robert A. Taft Sanitary Engineering Center.*

Symptoms	Number of patients	Percent of patients
Stomach cramps.....	164	87.3
Diarrhea.....	163	86.7
Headache.....	94	50.0
Nausea.....	92	48.9
Chills.....	74	28.7
Vomiting.....	46	24.4
Feverishness.....	40	21.2
Sore throat.....	20	10.6
Other.....	23	12.2

It appeared that the syndrome consisted primarily of severe abdominal cramps and watery diarrhea with nausea and vomiting less prominent. Nearly all the patients had improved within 12 hours and, although distressing to the patient, the illness appeared to be

of minor physiological consequence. Of the 25 hospitalized patients, who were the more severely ill, only 2 had temperatures (taken rectally) over 100° F., 1 of 100.4° and the other, 100.6°. The incubation periods of the 181 patients for whom sufficient information was available ranged from 1½ to 26½ hours, with a median of 9 hours, 35 minutes.

Information available from 301 passengers according to foods eaten and not eaten is shown in the table. Statistical analysis of these data, using a one-tailed chi-square test, shows that the increased risk which was associated with eating turkey dressing could be expected by chance less than once in a thousand times. The figures for turkey are not suitable for the chi-square test since so few persons did not eat turkey. Lesser, but significant, increase in risk was associated with eating bread and with eating ice cream. However, study of those eating these four foods separately and in various combinations reveals that the hazard from eating turkey, bread, and ice cream is due to the coincident eating of turkey dressing.

A sanitation survey of the train, crew, and food-handling operations was made by representatives of the Public Health Service. It was determined that all preparation and serving activities took place in the dining car. The food used in the preparation of the dinner was placed on board the diner approximately 36 hours before the train departed. Since approximately

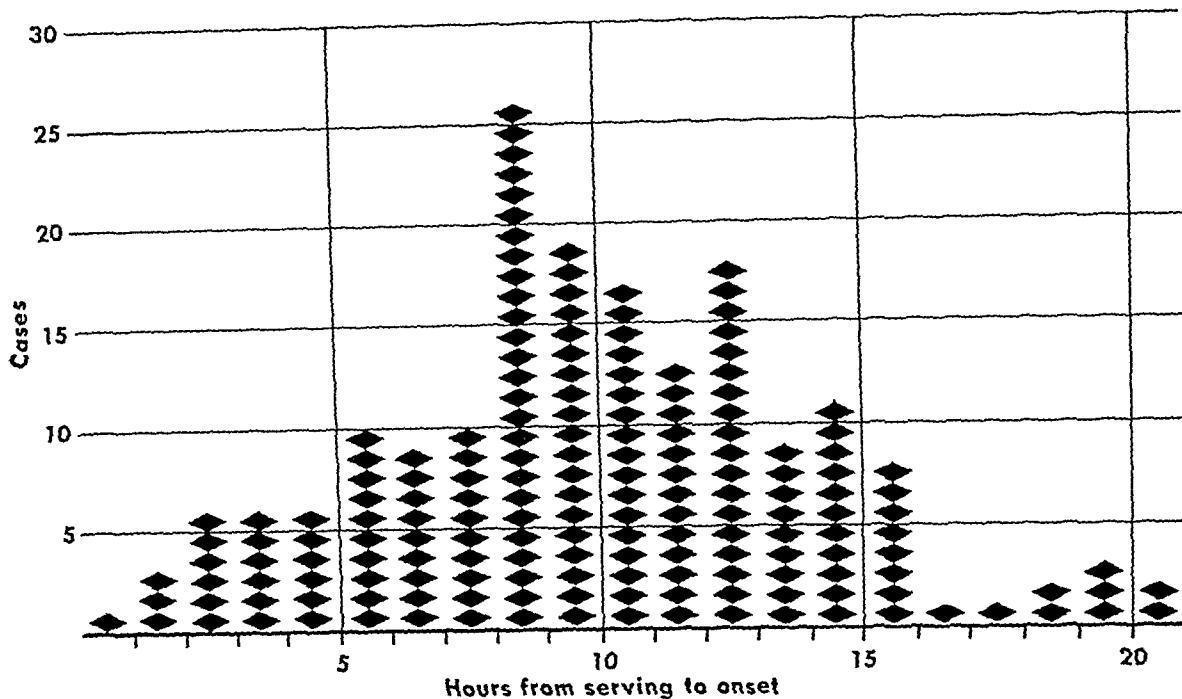
450 people were to be fed from the car, food preparation activities were begun approximately 30 hours before the serving, while the car was being moved to the train loading point. It is reasonable to assume that the quantity of perishable food involved must have severely taxed the refrigeration facilities of the car.

Turkey, the dinner entree, was initially considered a *prime suspect* as the causative factor of the outbreak. The turkeys had been purchased from a large meatpacker and, through prior arrangement, were delivered partially thawed directly to the dining car. Half of the 22 turkeys used in the meal were prepared Monday, starting about noon. Legs, thighs, and wings were boiled to make stock for the dressing and gravy. The backs were removed and sent to the railroad commissary for other use, and the breasts were baked in the oven. The stock and turkey were cooled at room temperature for approximately 2 hours before being placed in the refrigerator. The remaining turkey breasts were baked on Tuesday, and additional stock was prepared by boiling the remaining legs, thighs, and wings. The stock prepared on Tuesday was not refrigerated. On Tuesday afternoon the turkey was cold-sliced, put in pans with stock added for moisture, and reheated in the oven for about 45 minutes. After removal from the oven, the pans of sliced turkey were placed on top of the stove until serving time at 6:00 p.m. The dressing

**Gastroenteritis attack rates per 100, by foods eaten by 301 train passengers**

Food	Eaten			Not eaten		
	Total number	Number ill	Rate	Total number	Number ill	Rate
Turkey	296	187	63.2	5	0	0.0
Dressing	261	174	66.7	40	13	32.5
Gravy	269	170	63.2	32	17	53.1
Cranberry sauce	182	113	62.1	119	74	62.2
Potato	276	171	61.9	25	16	61.0
Peas	258	162	62.8	43	25	58.2
Bread	273	173	63.4	28	14	50.0
Butter	260	164	63.1	41	23	56.1
Ice cream	257	161	62.7	44	26	59.2
Milk	130	84	64.6	171	103	60.3
Coffee with cream	145	93	61.1	156	94	60.2
Coffee, black	62	36	58.1	239	151	63.2
Other food	53	28	52.8	218	159	71.1
Breakfast	282	171	60.7	19	16	84.2
Water from train	258	155	60.1	43	32	74.1

Distribution of 181 cases of food poisoning on an interstate carrier, 1959



was prepared Tuesday afternoon from bread, onions, celery, eggs, spices, and the stock.

The dining car refrigerator which was used to store a large portion of the perishable food was an old type "wet ice" box. At the time of inspection, about noon on Wednesday (the day the outbreak was discovered), the temperature of this refrigerator was 62° F. No supplementary dry ice was used to help cool the box, nor had any been used during the trip.

Samples of remaining turkey, dressing, beef, bread, milk, cranberry sauce, tomato juice, and bacon were examined bacteriologically to determine the total aerobic plate count and the presence of salmonellae, coagulase-positive staphylococci, enterococci, and clostridia.

All samples of drinking water taken from the diner and each of the coaches of the train were negative for coliform organisms. All samples of food were negative for salmonellae and coagulase-positive staphylococci.

However, the plate counts and determination of the most probable number (MPN) of enterococcus showed that cooked turkey, and especially the turkey dressing, contained large numbers of bacteria. For example, one sample of turkey had an aerobic plate count of 43 mil-

lion bacteria per gram and a confirmed enterococcus MPN of 4.6 million per gram. A sample of turkey dressing showed a plate count of 37 million bacteria and an enterococcus MPN of 240 million per gram. In contrast to the large numbers of bacteria found among the cooked samples from the railroad, very low values were observed for uncooked frozen turkey from the lot aboard the diner for which the plate counts were  $8-72 \times 10^1$  per gram and enterococcus MPN  $< 100$  per gram. These findings suggest that the conditions of food preparation and holding aboard the diner were conducive to heavy bacterial growth.

#### Discussion

Contradictory evidence exists in the literature about the pathogenicity of enterococci. They are commonly found in foods which cause no ill effects when eaten; however, feeding experiments on man suggest that large numbers of certain strains, if grown properly in selected foods, may produce illness (1).

Organisms resembling *Clostridium perfringens* (welchii) were isolated from thioglycolate enrichment cultures of turkey dressing taken from the diner. According to McClung



(2) and Hobbs and associates (3), outbreaks due to this organism are associated with meats and poultry that are cooked one day, allowed to cool slowly, and eaten the next day. Apparently, these circumstances prevailed in the preparation of food on the diner, the "stock" from the boiled wings and legs being used to moisten the dressing and to prepare the gravy.

Rectal swabs, blood, and vomitus for bacteriological analysis were taken from the 25 hospitalized patients. All of these specimens were negative for organisms of the typhoid, paratyphoid, and dysentery organisms, but *C. perfringens* was isolated from 13 rectal swab cultures.

The isolation of *C. perfringens* from incriminated food and from the victims' feces may be related. However, the clostridial isolates have not yet been identified as one strain. Although diarrhea and cramps are prominent in both enterococcal and clostridial food poisoning, the occurrence of vomiting in 24 percent of cases in the present outbreak resembles the reported enterococcal outbreaks more nearly than the clostridial (3,4). Further study of both types of organisms is contemplated.

In 1958, *C. welchii* (*perfringens*) was reported to account for 24 percent of the "general outbreaks" of food poisoning in England and Wales (5). However, these 64 outbreaks composed less than 1 percent of all incidents of food poisoning consisting of "general outbreaks," "family outbreaks," and "sporadic cases" occurring in that year. This is typical of the prevalence of *C. welchii* (*perfringens*) food poisoning in England and Wales as reported for the past decade. Food poisoning caused by this organism has either not occurred or has gone essentially unrecognized in the United States, since it was first observed by McClung in 1945 (2).

The identification of an organism as *C. perfringens* type A requires, in addition to anaerobic culture technique and numerous physiological tests, a series of procedures designed to elucidate the complex toxin-producing potential of the organism (3,6). These procedures are intricate and require antitoxins and reagents that are not produced commercially in the United States. Further identification

of a *C. perfringens* type A isolate as being food poisonous is based currently on heat-resistance of spores and serologic typing with reagents available only in England (3).

Most laboratories in the United States are not equipped to identify food poisoning strains of this organism because of the infrequency of *C. perfringens* food poisoning outbreaks and the unavailability of materials. Therefore, in an effort to compare the strains of *C. perfringens* isolated from samples of turkey dressing in this outbreak with those obtained from hospitalized patients, isolates from both sources were sent to the Central Public Health Laboratory, London, England, for serologic typing. *C. perfringens* isolated from patients, turkey, and dressing did not correspond serologically to those isolated in Great Britain in food poisoning outbreaks.

The occurrence of this outbreak emphasizes the scarcity in this country of the trained personnel and materials required for the identification of this organism and its various types. In order to fulfill its responsibility for control of foodborne disease aboard interstate carriers and for assistance to the State health laboratories, the Public Health Service needs to develop, evaluate, and disseminate information on the detection and identification of *C. perfringens*. Such techniques would permit an evaluation of the extent to which this organism is responsible for outbreaks of undetermined etiology, which now account for about one-half of the approximately 200 outbreaks reported annually in the United States.

## Conclusions

Although the causative factor of this outbreak has not yet been conclusively identified, the need for greater care in the handling of food served to the public is emphasized. It indicates the need for adequate facilities to do a safe job and the need for additional training and supervision of those employees to whom the health of the traveling public has been entrusted. Finally, the outbreak has served to alert health officials that enterococci and *C. perfringens* should be considered as possible causative organisms in food poisoning cases, and that

there is an immediate need to equip our laboratories for the identification of these organisms.

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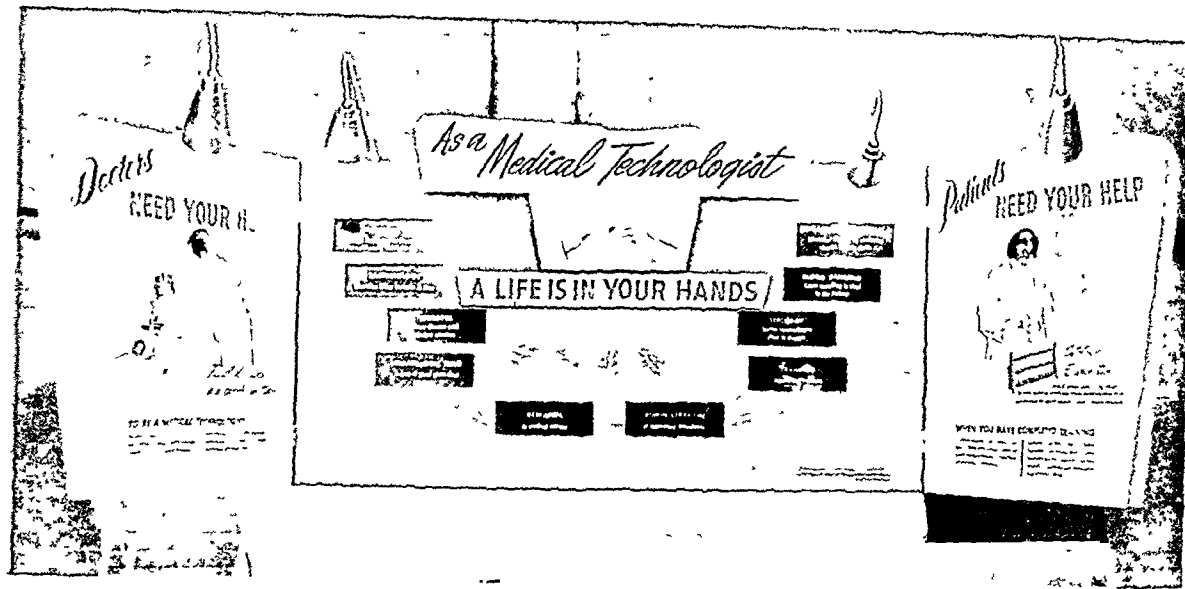
## Health, Education, and Welfare Trends

A 90-page booklet entitled "Health, Education, and Welfare Trends, 1960" has been issued by the Department of Health, Education, and Welfare. A statistical digest dealing with the Nation's human resources, it contains data and charts on such subjects as illness and medical care, educational attainment, social insurance, public assistance, and vocational rehabilitation.

Among the facts cited in the publication are:

- Public and educational construction totaled \$3.2 billion last year. During the past 12 years public school construction has accounted for 80 percent of the total.
- For each of fiscal years 1959 and 1960, hospital construction outlays reached almost \$1 billion. Four-fifths of the money was from other than Federal sources.
- Despite reductions in recent years, there are still more than 600,000 resident patients of mental hospitals.
- All Federal grants-in-aid totaled \$6.3 billion in fiscal year 1959. Grants for health, education, vocational rehabilitation, welfare, and employment security accounted for \$3.5 billion of the total.
- Federal expenditures for research and development are expected to approach \$7.5 billion this fiscal year. Less than 4 percent is for programs administered by the Department of Health, Education, and Welfare.
- Civilian per capita food consumption is nearly 1,500 pounds per year. Two-thirds of the total consists of dairy products and eggs; meats, fish, and poultry; and fruits and vegetables.
- Private expenditures for medical care and voluntary health insurance total about 5 percent of disposable personal income. In 1958, per capita expenditure for medical care was nearly \$96, distributed as follows: \$30 for hospital services; \$25 for physicians; \$25 for medicines and appliances, \$10 for dentists' services; and \$6 for all other medical expenditures.

Copies may be purchased from the Superintendent of Documents, U.S. Government Printing Office, Washington 25, D.C., at 50 cents each.



CC 1

## PHS Cancer Control Exhibits

Four new exhibits are available for loan from the Cancer Control Branch, Division of Special Health Services, Public Health Service, U.S. Department of Health, Education, and Welfare, Washington 25, D.C.

The exhibits may be borrowed free of charge from the branch. For large national and regional meetings, the branch will pay all the

costs of shipping and installing them; for smaller meetings, primarily of local interest, these costs will be borne by the borrower.

Instructions for assembling the exhibits are affixed to the inside door of each crate. Two men can assemble any of them in 30 to 45 minutes. Requests should be sent at least 1 month in advance of the date the exhibit is desired.

### As a Medical Technologist, A Life Is in Your Hands

Co-sponsored by the National Committee for Careers in Medical Technology, this exhibit is designed to aid in recruiting medical technologists. It emphasizes the importance of the profession, the fields in which technologists work (for example, cytology), and describes educational requirements and opportunities for employment. The exhibit is intended for possible recruits and those who disseminate information about careers, such as guidance counselors.

**Specifications.** (No. CC-1.) A 3-panel exhibit on legs, nearly 8 feet high, total weight 599 pounds, including the packing crate; center panel, 4 by 8 feet; 2 side panels,

each 4 by 4 feet, which swing forward on hinges as much as 90°. A minimum of 10 feet of backwall is needed. Lighting fixtures require one 1,500-watt outlet.

### Examinations for Cervical Cancer

Four examinations for cervical cancer, advantages of early diagnosis, and steps toward preventing incursions of this disease are depicted on this exhibit, which was co-sponsored by the Tennessee Chapter of the American Academy of General Practice. It is intended solely for physicians.

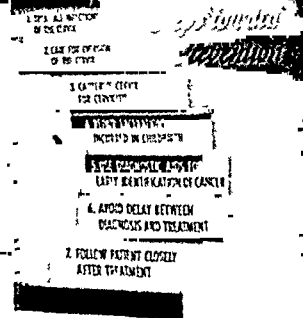
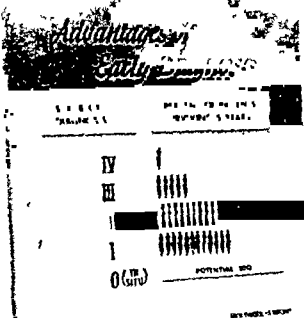
**Specifications.** (No. CC-3.) A 3-panel exhibit on legs, nearly 8

feet high, total weight approximately 375 pounds, including packing crate; center panel 3 feet 6 inches by 7 feet; each of 2 side panels 3 feet 6 inches square, swinging forward on hinges as much as 90°. A minimum backwall of 10 feet is needed. Four 300-watt lamps attached to the top of the exhibit require one 1,200-watt outlet.

### Silent Cervical Cancer Will Talk

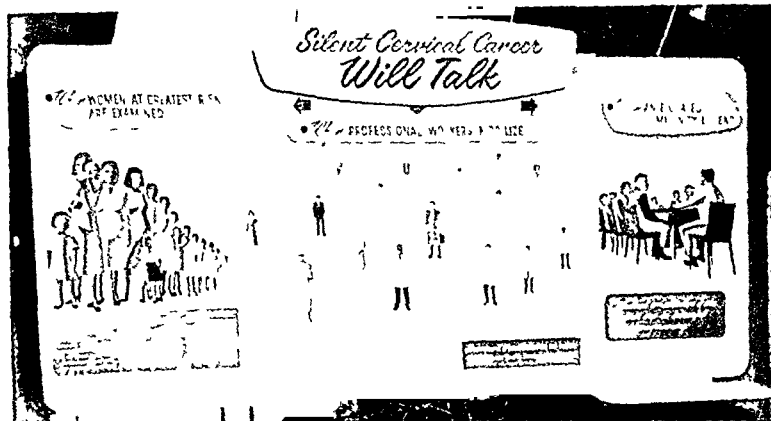
Intended primarily for public health workers who are interested in screening programs for cervical cancer, the exhibit stresses medical consultation, teamwork, and examinations in high-risk groups.

## CERVICAL CANCER



CC 3

**Specifications.** (No. CC-2.) A 3-panel exhibit on legs, 7 feet high, total weight 300 pounds, including packing crate; center panel, 4 feet by 4 feet 10 inches, placed slightly behind the left panel and slightly in front of the right panel, each 4 feet by 2 feet 4 inches. Overall width is nearly 10 feet. A fluorescent light under the title and lamps attached to the top of the panels require one 1,400-watt outlet.

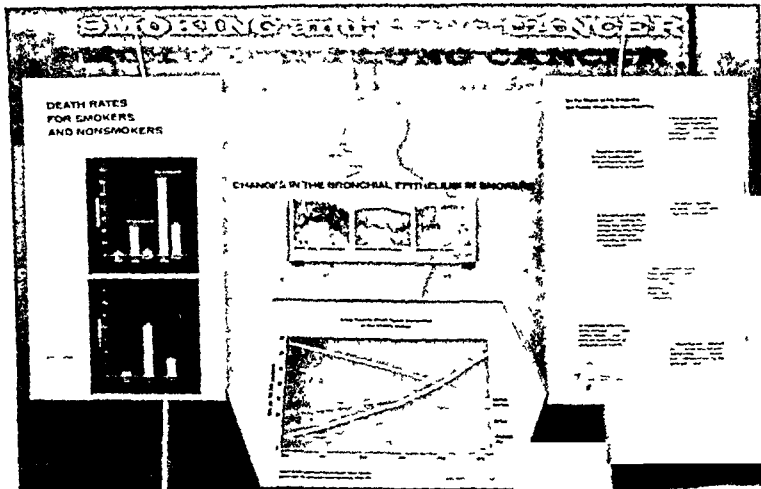


CC 2

## Smoking and Lung Cancer

This exhibit visualizes some of the major points presented in Surgeon General Leroy E. Burney's article, "Smoking and Lung Cancer," J.A.M.A. 171: 1820-1837, Nov. 28, 1959. The major points referred to are: death rates for smokers and nonsmokers, changes in the bronchial epithelium of smokers, the increasing death rate from lung cancer in the United States, and the conclusions reached by the Public Health Service on this issue.

**Specifications.** (No. CC-4.) A 3-panel exhibit on legs, 9 feet long, 7 feet 6 inches high, and 2 feet deep; total weight about 300 pounds, including packing crate. A separate literature rack requires a table 4 feet wide. Five fluorescent lights for the translucent panels require one 250 watt outlet.



CC 4

# Escherichia coli Strains As Etiological Agents Of Diarrheal Disease

FRED J. PAYNE, M.D.

A GREAT DEAL of evidence has been compiled during the past 15 years indicating that certain strains of *Escherichia coli* are intimately associated with diarrhea of the newborn. These *E. coli* strains are associated not only with cases of diarrhea occurring in hospital nurseries in the newborn but with sporadic cases occurring outside the hospital. In spite of the evidence, there is considerable doubt in the minds of many highly competent individuals that this association is one of cause and effect.

This paper reviews the currently available evidence concerning these organisms in an attempt to shed further light on this rather complex situation.

The idea that at least some strains of *E. coli* might be a causative agent of epidemic diarrhea of the newborn is not a new one. Adam described a biochemical type of *E. coli* which he felt was responsible for such an outbreak in Germany in the 1920's (1). He labeled his strain "dyspepsi-coli." However, biochemical variations do not permit a satisfactory classification of the genus *Escherichia*, and the work was not followed up.

Bray (2), working in Great Britain in the early forties, noted that the seminal odor which characterized the stools of infants with summer diarrhea originated from the *E. coli* found in them. Serologic studies showed the coli from

these cases were of one antigenic type. This strain, which was called *E. coli* var. *neopolitatum*, was recovered from 100 percent of the sick infants and only 4 percent of the healthy infants in their series.

This work was followed by that of Giles and co-workers (3) who were able to incriminate a strain of *E. coli* by similar methods as the etiological agent of an outbreak. The strain was called *E. coli* alpha type. The same authors subsequently described another serologically distinct strain found in a second outbreak, which they named *E. coli* beta type. Taylor and co-workers (4) in London later described a strain called *E. coli* D-433 as the probable cause of an outbreak in a nursery there.

By this time Kauffmann (5) had completed work on a serologic typing schema for *E. coli*. He described the *E. coli* beta type of Giles and associates as belonging to O group 55 of his schema, with an envelope antigen B5. The type strain for this O group had been recovered earlier from the pus of a middle ear infection. He further demonstrated that the *E. coli* var. *neopolitatum* of Bray, the alpha type of Giles and associates, and the D-433 of Taylor, all belonged to a new O group, which he designated 111, and that these strains had the same envelope antigen, B4. Since that time *E. coli* O55B5 and O111B4 have been found in widely scattered outbreaks of diarrhea of the newborn throughout the world. A number of other serotypes of *E. coli* have subsequently been found to be involved with this disease in single or multiple outbreaks. A recent review of this problem, with extensive bibliography, has been presented by Neter (6).

In most of the epidemics in which these organisms have been incriminated, the pattern has been similar. The particular coli type has been found to be present in almost pure culture in the stools of sick infants and has been found infrequently in the stools of healthy infants in the same environment.

I have had the opportunity to investigate five such outbreaks during the past 6 years. Two were associated with *E. coli* O55B5, two with *E. coli* O111B4, and one with *E. coli* O127B8.

Rarely were members of the nursery staff found to be infected with the epidemic strain in these outbreaks. The source of four of the

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Dr. Payne is assistant chief of the Phoenix, Ariz., field station of the Communicable Disease Center, Public Health Service. The article was presented as a paper at the 17th annual conference of the U.S.-Mexico Border Public Health Association in Brownsville, Tex., and Matamoros, Tamaulipas, Mexico, on March 31, 1959.

outbreaks could not be clearly determined. But in one instance an infant acutely ill with diarrhea was admitted to an open pediatric ward and ignited an outbreak.

As an increasing number of outbreaks associated with these organisms were reported, the problem of their epidemiology outside the hospital became more pressing. A study done by the Public Health Service in New Orleans in an effort to find O groups 55 and 111 in healthy infants and children disclosed one O111 in 576 children. Similar studies carried on in Denmark on an even larger scale showed a similarly low yield (?).

### More Etiological Agents

Subsequent studies have contradicted these earlier findings. Gamble and Rowson (8) reported that they had found enteropathogenic *E. coli* in 20 percent of their routine stool examinations in infants under 1 year of age. Their reason for designating some of the serotypes in their investigations as enteropathogens is not clear; however, they include types which are not generally accepted as enteropathogenic. This serves to illustrate a fundamental problem in working with these organisms. We must be exceedingly careful in our designation of a type as enteropathogenic. Only for three serotypes, O111B4, O55B5, and O127B8, do we have what amounts to conclusive evidence that their association with diarrhea is one of cause and effect. They have been found repeatedly throughout the world associated with epidemic diarrhea of the newborn, and they have been shown experimentally to be capable of producing a gastroenteritis in human adults when ingested in large numbers.

In addition to these three types, evidence is mounting that certain other types alluded to earlier in this paper may be etiological agents as well. These are O26B6, O86B7, O112B11, O119B14, O124B17, O125B15, O126B16, and O128B12. In all, about a dozen types fall under scrutiny as possible or probable enteropathogens on the basis of previous involvement in nursery outbreaks. Until we are sure not only of their pathogenicity but also of their epidemiological characteristics, we must be careful about interpreting data which lump them all

together. For the present, the data for each type must be analyzed separately and evaluated on its own merits.

In studies carried out in Phoenix, Ariz., from October 1957 through February 1959, enteropathogenic *E. coli* have been associated with 25 percent of some 474 cases of acute diarrhea in children under 2 years of age admitted to three hospitals in the area. *Shigella* infections accounted for an additional 25 percent. Among 98 infants under 2 months of age in this series, however, these *E. coli* types were found in 40 percent, whereas shigellae were found in only 8 percent. It is obvious that in the age groups where the highest mortality occurs, enteropathogenic *E. coli* constitute a very important cause of diarrhea. Almost half (46 percent) of the *E. coli* infections in this age group were with O groups 111 and 55.

In an attempt to piece together the epidemiology of the enteropathogenic *E. coli* as it exists outside the hospital, we have carried out studies on the families of infants who are admitted to the hospital infected with one of these organisms. We found that the infection rate among 244 contacts of all ages for all types of *E. coli* was 12.4 percent. Only rarely was a type encountered other than the one found in the index case. The rate varied little by age group. It was 14 percent in the age group 0 to 4 years and 13 percent in the age group 20 to 49 years. The secondary infection rate varied somewhat by type; however, the rate was 17 percent for O55 compared with 10 percent for O111 and 7 percent for O126. The numbers of other types were too small for individual analysis, but collectively their secondary infection rate among family contacts was 11 percent.

These rates are somewhat higher than those obtained for salmonellae in the same study. The secondary infection rate among family contacts of patients with salmonellosis was 8 percent. One must be cautious in interpreting this difference, however, because the ability of the laboratory to recover salmonellae and enteropathogenic *E. coli* from carriers is probably quite different. With better tools, the rate for *E. coli* could be expected to be considerably higher. No evidence has been uncovered as a result of these investigations which would

allow us to draw hypotheses as to the epidemiology of these organisms. All of the families were poor since our cases were principally charity cases. Pets or livestock were found infrequently on the premises. The diets of these people are marginal, but overt malnutrition is uncommon.

## Conclusion

There appears to be a cause and effect relationship between at least three serotypes of *E. coli* and diarrhea of the newborn. In addition, there appears to be a relationship between eight or nine other serotypes and this disease. Perhaps still others will be found in the future.

The natural history of these types outside hospital walls remains obscure, but they constitute a leading cause of cases of severe diarrhea among infants under 2 months of age whose onsets are at home as well as those occurring in hospital outbreaks. There is no assurance that environmental control measures now in vogue for diarrheal diseases will be effective in the control of these agents.

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## New Radiation Health Publication

The first issue of a new monthly technical publication giving levels of radioactivity in the environment appeared in April 1960.

Entitled *Radiation Health Data*, the publication is prepared by the Public Health Service as an outgrowth of a directive by the President in August 1959 that the Department of Health, Education, and Welfare "intensify its radiological health efforts and have primary responsibility within the executive branch for the collation, analysis, and interpretation of data on environmental radiation levels."

Data on radiation levels in the air, water, and milk comprise the bulk of this issue of the periodical, which presents facts compiled from a number of sources by the Public Health Service's Division of Radiological Health, with the assistance of a board of editorial advisers representing the Departments of Health, Education, and Welfare, Defense, Agriculture, and Commerce, and the Atomic Energy Commission.

Among the contents of this issue are data on strontium 90 in milk collected during November 1959 at 12 locations in the United States by the Public Health Service; milk collected during the same month at 3 locations by the Atomic Energy Commission; and monthly milk collections for the year ending August 1959 at 6 locations in Minnesota as reported by the State health department.

Most of the radiation measurements carried by the new publication will be in the form of raw data which will be susceptible to meaningful analysis or interpretation when these data accumulate and more knowledge of the biological effects of radiation begin to come out of research by Federal, State, and local agencies, and by industry and universities.

The price of the publication is 50 cents an issue or \$3 per 6-month subscription. It is available from the Office of Technical Services, U.S. Department of Commerce, Washington 25, D.C.

# Impact of Government Programs on Voluntary Hospitals

MILTON I. ROEMER, M.D., and MARY HELEN McCLANAHAN, M.A.

**A** LONG CONCERN in American life has been to extend health services to the population through organized measures, while not stifling individual initiative and responsibility. This concern is now particularly directed to the potential influence of government on our voluntary hospital system. Fear is expressed that various financial innovations may lead to governmental domination or even the complete governmental control of hospitals.

This is, of course, not the first time that the phenomenon of governmental participation in the provision or the financing of health services has been greeted with apprehension. Voluntary initiative is naturally cherished in America, and encroachments on it, even if they are only potential, have long been resisted. Yet over the years the role of government in health service has steadily expanded. New public programs have evolved at all levels: local, State, and Federal. And these programs have involved a widening scope of technical activities in medical care in general and hospital service in particular.

It is not necessary, therefore, to speculate unduly on the influences of government on voluntary social institutions. A vast experience exists and can be studied. Specifically, it is quite possible to determine the actual impact of governmental programs on voluntary hos-

pitals in the United States. This paper reports the preliminary findings of such an investigation.

Our first task was to identify and define the principal governmental programs now impinging on voluntary hospitals. These are found operating at all political levels and may be conveniently classified as programs which support specified beneficiaries, provide general financial assistance, or have regulatory authority. We are not considering governmental provision of hospital service per se, an expanding practice also, but rather only governmental impacts on existing voluntary hospitals. The principal governmental programs whose impacts were to be explored were classified as follows:

## *Support of Specified Beneficiaries*

### *Federal*

- Veterans "hometown" care.
- Military dependents ("Medicare").
- Members of the armed services on leave.
- American Indians.
- Federal employees with compensable injuries.
- Other Federal beneficiaries.

### *State*

- Public assistance "categorical" recipients (old-age assistance, dependent children, blind, or totally and permanently disabled).

- Injured workers (workmen's compensation).

- Patients with cancer or other specific conditions (in certain States), excluding mental illness and tuberculosis.

- Vocational rehabilitation clients.

- Other State beneficiaries.

### *Local*

- General assistance recipients.

- Other local government beneficiaries.

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## *Provision of General Financial Assistance*

### *Federal*

Hospital construction grants (Hill-Burton law).  
Research grants.  
Federal tax exemptions.  
Other Federal assistance.

### *State*

Hospital construction grants (certain States).  
Research grants.  
Laboratory or X-ray services.  
Commodities (drugs, food, and so on).  
State tax exemptions.  
Other State assistance.

### *Local*

General financial grants, such as "deficit" subsidy.  
City or county tax exemptions.  
Other local government assistance.

## *Regulatory Programs*

### *Federal*

Narcotics and alcohol control.  
Federal trade and labor legislation.  
Other Federal regulations.

### *State*

Hospital licensure or approval law.  
Supervision of nursing education.  
Labor legislation (protection of women and children, and so on).  
Other State regulations.

### *Local*

Public health or sanitary regulations.  
Fire prevention code.  
Other local regulations.

Thus, there are some 30 clearly definable governmental health programs, and several "others" which may be found in different places, now operating in an average community. All or most of these may be expected to have a variety of impacts on voluntary hospitals. The problem is complicated by the fact that for nearly every program a different Federal, State, or local public agency is involved. From the research point of view, however, this widens the sample of "influences" and permits more reliable generalizations.

The nature of these governmental impacts on hospitals is not so easy to define, let alone to measure. Objective effects may be quite different from subjective perceptions. As a first approach, however, we felt that some insight could be gained by tapping the impressions of hospital administrators on the effects of these specific

programs. Thus, we set out to examine the "observed" impacts of governmental program on voluntary hospitals, which hopefully correspond closely but not necessarily exactly to the objective impacts of these programs.

For each program listed, the potential impact was to be examined in terms of one or more of five aspects. These concerned the program's influence on patient care, motivation of the hospital staff, administrative practices, financial support, and development of services and facilities. A schedule was constructed to elicit impressions of hospital administrators on all or some of the potential consequences that might be anticipated from each of the specific programs. The first draft of this schedule was pretested by interviewing six hospital administrators from six different States, who were available at a summer postgraduate institute. After revision on the basis of this testing, the schedule was applied, by direct interview of the administrators, in 10 hospitals of upstate New York. The final study will cover about 100 hospitals in several States. These interviews, carried out on the spot in each hospital, were done with care, requiring 3 to 8 hours each. In six places they were supplemented by interviews with other members of the hospital staff for data on specific points.

## *Findings*

The 10 institutions in which governmental impacts were examined were all general hospitals under voluntary nonprofit auspices. Two were Catholic, the others nonsectarian. They ranged from 52- to 450-bed capacity, with an average size of 218 beds. All were well established in their communities, the newest being 34 years old and the oldest 108 years. No claim is made as to the representativeness of this sample; it was selected mainly by proximity of the hospitals to Cornell University, but with an effort to cover a range of sizes and to include several which had received Federal construction grants. The findings, however, on the observed impacts of current governmental programs on voluntary hospitals provide several clues which may be later explored in a larger sample of institutions. The effects of each type of governmental program, in the judgment of the

hospital administrator, will be considered according to the general categories cited.

### *Specified Beneficiaries*

All 10 voluntary general hospitals served one or more of the several categories of health beneficiaries of the Federal Government. The volume of such cases in all instances, however, was small. The recent trend, moreover (within the last 10 years), has been toward a stationary level or a decrease in the percentage of total hospital income derived from this source. It was for this reason perhaps that the administrators stated that the several programs for Federal beneficiaries had only a negligible influence on overall hospital operations, including utilization, financing, patient care, or other possible consequences.

In response to a specific question on whether these Federal funds for specified beneficiaries "have caused the Government to exercise control over your operation or management," all 10 administrators responded "no control." The same uniform response followed a question on whether the Federal program had "caused, either directly or indirectly, the board in your hospital to change its policies and programs." Furthermore, all reported "cooperation between the hospital staff and Government officials administering Federal medical care programs" to be "good" or "very good." None reported relationships as "fair," "poor," or "very poor." These uniformly favorable reports are perhaps all the more remarkable in view of the fact that four or five separate Federal agencies are involved in the administration of these programs.

All 10 hospitals reported service to one or more groups of specified beneficiaries of the New York State government. The relative volume of cases, again, was small; those who could estimate its financial impact on the hospital believed it to be under 1 percent of the total income. Mentally ill and tuberculosis patients were not considered in this report since they are customarily cared for in State-operated hospitals. The patients usually recognized as beneficiaries came under the vocational rehabilitation, crippled children's, or workmen's compensation programs, involving three separate State agencies. Statewide data show that payments for workmen's compensation cases con-

stitute about 2.5 percent of hospital income, an impact obscured by the fact that, although workmen's compensation is a governmental program, payments are made by different insurance companies. In New York State, public assistance beneficiaries are not handled by the State but by local units of government. A few administrators stated that the funds received for these beneficiaries had been of some help to the hospital in developing rehabilitation services. In all instances, relationships with State government officials were said to be "good" or "very good."

Specified beneficiaries of local governments were also served by all 10 hospitals. Indeed, since local governments in New York State are responsible for all categories of public assistance recipients, the estimated volume of care provided this group by the local government was greater than that provided for beneficiaries of Federal and State Governments. However, it should be kept in mind that the funds for financing medical care of these needy persons are derived from the Federal and State, as well as local, governments, even though the payment of hospital and medical bills is a function of county welfare departments. As a portion of hospital income, funds paid by local government for its beneficiaries were estimated to vary between about 1 percent and 11 percent, with half of the administrators stating 5 percent or more.

With this larger relative volume of beneficiaries coming under local government administration, it is not surprising that the observed effects of government participation in health services were greater for local than for Federal and State Governments. Half of the 10 administrators stated that these local government funds had enabled them to give better care to patients. Comments were made on the effect of these programs in helping to finance better equipment, improved child health services, rehabilitation, and outpatient department services, or in maintaining higher utilization of the institution. One hospital, incidentally, was reported to have kept its bed complement above a certain threshold level, in order to be entitled to a higher reimbursement rate for the care of local government beneficiaries. Greater impacts on a hospital were associated with higher

percentages of income derived from local governmental sources.

In contrast to health services for State and Federal beneficiaries, administration of programs for beneficiaries of local governments drew some criticism. Two hospital administrators expressed the belief that the program exercised some control over the operation of the hospital. One of these expressed fears about the future extension of governmental supervision over the care of the indigent, although current "controls" were deemed to be reasonable. No specific question was put to the administrators on the adequacy of local governmental payment rates, but in response to an invitation for "other comments" four volunteered that the rates were inadequate. One of these remarked specifically about the exclusion of expenses for teaching and research in computing hospital per diem costs. In this connection, it should be kept in mind that payment rates to hospitals by local welfare agencies for the care of needy persons are determined in part by the New York State Department of Social Welfare. In one instance, there was a complaint about the payment rate for hospital care by a Federal program, that for military dependents. As for relationships with local government officials, seven hospitals reported them to be "good" or "very good," but three stated that they were only "fair."

It is evident that among the three levels of government responsible for supporting hospital services for designated beneficiaries, negative reactions of hospital administrators seemed to be concentrated on local agencies. Even here, however, the majority of the hospital administrators interrogated appeared to evaluate the impact of the governmental program favorably.

#### *General Financial Assistance*

Federal, State, and local governments all provide varied forms of general financial assistance, not tied to specific beneficiaries. At the Federal level, best known is the Hill-Burton program providing grants to the States for helping to meet hospital construction costs. Five hospitals in the study had received such aid. The administrators of all five stated that these grants had not led to any governmental

control over hospital operation, but one thought the construction standards applied were "excessively demanding." The only comment on "controls" over hospital operation by the Federal Government was made by one administrator regarding supervision over the use of radioactive substances; this is exercised by the Atomic Energy Commission and was deemed to be reasonable. Four administrators of hospitals receiving construction grants believed their hospitals had been aided in providing improved patient care.

Federal research grants had been received by two hospitals. These administrators thought the requirements for receipt of this assistance were reasonable or "nonexistent." These grants were said to add prestige to the hospital, thus facilitating recruitment of staff, and to improve the care of certain patients. However, one administrator mentioned space problems caused by the research work.

Other forms of Federal assistance come to hospitals through certain benefits in kind. Nine hospitals had received surplus food from the U.S. Department of Agriculture, according to a formula based on the number of welfare beneficiaries served per month. Seven had received durable surplus property, including autoclaves, incubators, and office equipment, through the New York State Department of Education. The reaction to this type of assistance was generally favorable because of the financial savings.

The State government provides general financial assistance to hospitals in the form of free laboratory services. Four of the 10 voluntary general hospitals in the study reported such aid through the privilege of having serologic tests and various bacteriological examinations done without charge by a State public health laboratory. It is probable that more than these four hospitals avail themselves of such State services.

A variety of other forms of assistance from the State government was reported by several hospitals. These included free drugs, such as silver nitrate for instilling in the eyes of newborn infants and poliomyelitis vaccine for immunizing hospital employees. Two hospitals mentioned support for routine chest X-rays

on all admissions, through a New York State Department of Health award of \$1 per film. Other benefits mentioned were the training of a hospital laboratory technician in a State laboratory, with governmental assumption of the technician's salary during the training period, provision of teaching material for a prenatal class, the services of a heart specialist at periodic cardiac clinics, and epidemiological consultation on a problem in the nursery for the newborn. One hospital, which serves as a teaching center for a New York State-operated medical school, receives a substantial subsidy from the school; its agreement with the State government calls for a grant to meet the annual deficit, after an official audit. In 1958, for example, this amounted to \$240,000.

All of these forms of general financial assistance from the State government, direct or indirect, were regarded favorably by the hospital administrators, and were not associated with excessive administrative demands.

At the local government level, none of the 10 administrators reported aid in meeting construction costs, balancing of deficits, acquisition of real property, or the like. Three hospitals reported that free diagnostic tests were performed for the hospital by a county or city governmental laboratory; another hospital performed laboratory services for the county health department, for which payment was received. Two hospitals enjoyed savings on their water bill, through special action of the local government.

One other form of indirect financial support is provided to all voluntary nonprofit general hospitals by all levels of government. This is exemption from certain taxes which must be paid by other economic enterprises. The administrators were queried on the procedural requirements for receiving these tax exemptions. All 10 thought the Federal and State Government requirements reasonable for granting the exemptions. In addition, five hospital administrators cited exemption of tax payments on alcohol as offering significant savings; one of these mentioned a saving of \$19,000 in the previous year.

Exemption from local property taxes was reported by nine hospitals. The 10th institution is associated with a private medical clinic

and pays \$8,000 a year in local taxes. Of the nine hospitals, six administrators said the local tax exemption was a substantial benefit, two a moderate benefit, and one thought it inconsequential.

### *Regulatory Functions*

Unrelated to any program of financial support, Federal, State, and local governments exercise certain regulatory authority over voluntary hospitals. The statutory authorities for these regulations differ widely, but all are designed to protect the public interest. The most widely applicable Federal regulation affecting hospitals is the narcotics control program of the Treasury Department. All 10 hospital administrators were familiar with this authority, and 9 thought it was reasonable. The 10th was critical only because he believed that the scope of the controls was not broad enough; he thought they ought to be extended to cover all hypnotic drugs, as well as the legally defined narcotics.

As implied by the restricted Federal authority specified in the United States Constitution, regulatory functions are exercised most extensively at the State government level. Voluntary general hospitals come under the supervision of several separate State agencies, with respect to different matters.

In contrast to most other States, overall certification and approval of hospitals in New York is a responsibility of the State department of social welfare, and all 10 administrators had had some experience with this authority. The frequencies of official inspections recalled by the administrators, however, varied greatly. Two stated the last inspection had been made 6 years ago, one estimated the frequency of inspections as "every 5 years," two as "every 3 years," two as "every 2 or 3 years," and the remaining three as "less than annual" or "don't know." As the apparent irregularity of these visits might suggest, the estimated impact of this regulatory program was uneven. Three administrators thought the inspections were inadequate and made no particular difference to the hospital. Two thought the inspectional authority "excessive," but still exerting "no effect" on the administration of the hospital. Two others thought the program

"about right" in its scope, yet having "no effect" on the hospital. On the other hand, three administrators thought the inspectional authority to be proper and to have stimulated improvements in the operation of the hospital. One of these explained that the social welfare department inspections and recommendations gave the administrator "leverage" with the board of directors in initiating needed changes in the hospital.

Despite the irregularity of on-the-spot inspections by State authorities, all hospitals must send financial reports annually to the State welfare department. No objections were raised to this requirement, which serves as a basis for computing maximum reimbursement rates, shared by the State government, for the care of public assistance beneficiaries. Reports are also required of any new construction at a hospital, and architectural plans must be approved by the State welfare department regardless of the source of financing, that is, independent of approval of construction under the Federal Hill-Burton program. This requirement was criticized by two administrators, who thought it was unnecessarily time consuming and unreasonable. They questioned how review of construction plans by a nurse could be justified.

In New York State, inspection and approval of nurseries for the newborn is a function of the State department of health. While overall hospital approval has long been a welfare department responsibility, a number of tragic epidemics of diarrhea among infants in hospital nurseries some years ago led to the assignment of special authorities in this field to the public health agency. The standards applied in this regulatory field are apparently somewhat rigid, and comments on them by the administrators were more voluble than on any other type of regulation. Three administrators complained that the nursery regulations caused additional expenses and much extra work. There was dissatisfaction with the requirement that nursing personnel could not be transferred from the maternity service to other sections of the hospital, even in periods when occupancy in the maternity ward was low. These administrators felt that this requirement caused inefficient use of expensive manpower. Yet they all conceded that these regulations had stimulated improve-

ment in the quality of care of the newborn. One administrator was seeking financial support from the State government for the operation of a unit for premature babies.

Supervision of schools of nursing comes under the State department of education. Four of the 10 hospitals studied conducted such schools, and the directors of these nursing schools were interviewed. All four thought the educational regulations were reasonable and helpful and gave the schools adequate leeway in running their own affairs. One director, however, expressed the view that the department of education overemphasized the academic, as against the practical, aspects of the nursing school program.

A variety of other State government regulations were mentioned by the hospital administrators, but none with any rancor. The legal supervision by the New York State Department of Labor on employment of minors was deemed reasonable, as was the safety inspection of water boilers and elevators. Two administrators even expressed the opinion that State requirements on fire prevention and sanitation might desirably be imposed in communities where local regulations in these fields were weak or lacking. Occasional inspections under the food and drug control laws of the State were mentioned, without objection. One administrator did make reference to the professional licensure acts for nurses and pharmacists, with the comment that they tended to restrict hospitals unduly in the engagement of such personnel.

Turning to regulatory functions under local government, all 10 hospital administrators had noted the operation of local regulations in the field of environmental sanitation. This authority, exercised by the local health department or health officer, was deemed reasonable by eight administrators. The criticisms by the other two, indeed, were that the standards applied were inadequate or that enforcement was too weak.

Fire prevention regulations were recognized by nine administrators, without any negative reactions. As an example of the concrete effects of these regulations, one administrator reported the recent installation of new fire protective equipment. Local regulations on the control of air pollution (furnace operation)

were criticized by two administrators as excessively demanding.

### *Competition by Government*

A final aspect of governmental impacts on voluntary general hospitals, which had not been anticipated in the original research design, emerged from the interviews with administrators. This was the role of government as a "competing" organization through its operation of public hospitals. We did not examine this effect in detail, but certain findings appeared.

Apparently due to their location in a large city, where a Federal Veterans Administration hospital exists, two hospital administrators reported a double influence of government on voluntary hospitals. First, they stated, the Federal hospital "took patients away" from them; if a veteran was legally entitled to free care in a governmental facility, why should he pay for it in a voluntary unit? Second, the personnel policies of the VA hospital, especially the wage rates, put the voluntary hospitals under pressure to offer competing conditions in order to recruit staff. While the two administrators could not really condemn these competitive forces, they said their jobs were thereby made harder.

A similar competitive influence of State government was reported by one administrator, whose hospital was close to a specialized rehabilitation center operated by the State department of health. This publicly financed center naturally attracted handicapped patients who might otherwise have gone to the voluntary hospital. Competitive influences of local government were not reported.

### **Comment and Conclusions**

This report of a pilot study of governmental impacts on voluntary hospitals must be taken for what it is, preliminary rather than conclusive. Even so, certain impressions and suggestive ideas emerge.

First of all, it is clear that a great variety of governmental programs are now in operation and are exerting numerous influences on the Nation's voluntary general hospitals. The programs emanate from all political levels—Federal, State, and local—and involve support for

specified beneficiaries, general financial assistance, public regulation, and competitive services.

Second, the overall influence of these programs on the operation of voluntary hospitals is judged by administrators as neutral or beneficial. Negative criticisms are in the minority. Relationships between the hospitals and governmental administrative authorities are, on the whole, good; there seems to be very little evidence of any sense of domination by government.

Third, the quantitative impact of government on the hospital's operation and development appears to be greatest for programs giving general financial assistance, next for programs supporting specified beneficiaries, and least for regulatory programs. The specific beneficiary programs, on the other hand, should perhaps be judged more by their impact on individual patients than on hospital administration per se. The regulatory programs are criticized as often for their weaknesses as for their strengths; their impact is evidently greatly reduced by voluntary standard setting or "accreditation" programs in the same field. One must even suspect that in many, if not all, programs, governmental agencies have leaned over backwards to keep their requirements minimal, even though their mission is manifestly to protect the public welfare.

Fourth, unlike common assumption, the extent of "controls," at least those recognized as restrictive or objectionable, is not related to the extent of money granting authority. The agency that pays the piper is apparently felt to be calling the tune more gently than the one that doesn't. While the overall reaction of hospital administrators, even to regulatory programs, is neutral or slightly favorable, there are more criticisms of the exercise of these authorities than of those associated with grants of money.

Fifth, another common assumption was shaken by the finding of a generally more favorable attitude toward programs emanating from the Federal Government than from State or local authorities. Reactions to all governmental programs were predominantly favorable, but the strongest criticisms related to local government.

Sixth, it appears that administrators of voluntary general hospitals are, on the whole, living contentedly with a great variety of governmental programs, not regarding them as particularly disturbing in one direction or another. There were, indeed, some apprehensions expressed about government, but they nearly always referred to *some suspected future*, rather than to current or past experiences. In a sense, the overall equanimity of responses was the most significant finding of this pilot study; the minority of negative responses often emerged from second questions rather than coming spontaneously. This is all the more interesting in view of the conduct of this pilot study among voluntary hospitals in upstate New York, a region long known for its conservative attitudes toward government, in general.

Finally, reading between the lines of the responses to the structured interviews, one detects much inadequate understanding of governmental programs and authorities by some administrators. The rules of the game are sometimes not clear, and one suspects that an occasional impression of governmental rigidity comes from a philosophical mind set, rather than from a positive knowledge of governmental policies. On the other hand, with the

great number and the changing character of governmental agencies and programs, it is small wonder that hospital administrators are sometimes not fully informed on all the details. It is trite, perhaps, to point out a need for coordination and streamlining of governmental programs.

*These comments must be offered more as impressions than as definitive conclusions. Doubtless they are contrary to the impressions of some persons, although much that is said about the influence of government on voluntary institutions in American life is manifestly based on an a priori ideology and anxiety about the future, rather than on objective observation today. Whether a great extension of governmental impacts on voluntary hospitals in the future would alter the evaluations of administrators is another matter, but it would seem that actual experience has greater prognostic value than speculation. It is our hope to pursue this question with a larger sample of voluntary general hospitals, in various parts of the United States. It is hoped also to explore the impacts of government beyond their perceptions by administrators and down to their measurable consequences in actual hospital operation.*

## American-Soviet Meeting on Poliomyelitis

A mission selected by the Public Health Service represented the United States at an American-Soviet meeting on poliomyelitis in the Soviet Union May 12 to 16, 1960. The first under the U.S.-U.S.S.R. exchange agreement of November 1959, the mission followed the invitation of the Minister of Health of the U.S.S.R. A similar joint meeting in the United States is scheduled for 1961.

Dr. David E. Price, Assistant Surgeon General of the Public Health Service was personal representative of the Surgeon General and chairman of the United States delegation. Among the members were Dr. Roderick Murray, of the Service's National Institutes of Health; Dr. Alexander Langmuir, of the Pub-

lic Health Service's Communicable Disease Center, Atlanta, Ga.; and Dr. Albert Sabin of Children's Hospital, Research Foundation, Cincinnati, who developed the live poliovirus vaccine now widely used in the Soviet Union. The following topics were discussed:

- Evaluation of the results obtained in mass immunization of the population with live poliomyelitis vaccine from the Sabin strain.
- Report on American activities with reference to live poliovirus vaccine.
- Evaluation of quality control methods for live poliovirus vaccine.
- A program for joint Soviet-American studies on poliomyelitis.

# Age, Social, and Demographic Factors in Acceptance of Polio Vaccination

FRANCIS A. J. IANNI, Ph.D., ROBERT M. ALBRECHT, M.D., M.P.H., WALTER E. BOEK, Ph.D., and  
ADELE K. POLAN, M.A.

IN ORDER to find the best means of promoting use of the Salk poliomyelitis vaccine, particularly in age grades where it is most important, the New York State Department of Health sought data on the level of vaccination by age grade within the State and on the social and psychological factors influencing the decision to accept or refuse such vaccination.

In an earlier study, the bureau of epidemiology and communicable disease control of the State department of health had obtained data on poliomyelitis vaccination among all family members of a sample of school children in every county of New York State. Since many families have no school-age children, however, this study gave only a partial picture. For a more comprehensive view with sociocultural and psychological dimensions, a new study was conducted during the spring and summer of 1957 with sampling based on total populations.

Specifically, the objectives were: (a) to provide basic data for estimates of the level of

poliomyelitis vaccination by age grades in the State population, (b) to obtain information on the comparative demographic and social characteristics of vaccinated and nonvaccinated groups, (c) to elicit data on sources of information and other factors connected with decisions to accept or refuse vaccination, and (d) to provide the department with information necessary to plan a comprehensive health education program designed to appeal to those population groups with a low level of vaccination experience.

This paper is concerned with the first two of these objectives and presents the findings on vaccination levels by age, sex, social class, and education. Forthcoming papers will deal with other aspects of the study.

## The Study Design

Because of the impossibility of interviewing every family in New York State or, with time and cost limitations, to sample on a statewide basis, it was decided to choose two counties of both rural and urban populations in which to conduct intensive interviewing. The basic methodology was the home interview utilizing a number of diachronic area probability samples in each county. The two counties chosen were Rensselaer County, a semirural county with one large city, Troy, one small city, Rensselaer, and several villages with a large, rural unincorporated area; and Westchester County, an urban and suburban county which adjoins New York City. Westchester

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*Dr. Ianni is professor of anthropology and psychology at University College of Addis Ababa, Ethiopia. At the time of this study, he was associate professor of anthropology and psychology in Russell Sage College, Troy, N.Y. Dr. Albrecht serves as director of the bureau of epidemiology and communicable disease control, Dr. Boek as research anthropologist, and Mrs. Polan, as senior biostatistician in the New York State Department of Health. The research described in the paper was carried out under New York State Department of Health Contract C-12482.*



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- A program for joint Soviet-American studies on poliomyelitis.

estimation of the population of the county by census tracts for use in setting up new tract boundaries in the census of 1960. The most serious problem was the absence of any reasonably priced maps of recent vintage for the county. A commercial house in the county had maps which indicated every dwelling unit in the county and which were kept current for use by insurance companies and commercial consumer research groups. The cost of renting the maps for 1 week, however, was slightly more than the amount allocated for the entire project. We were fortunate in that the Westchester County Planning Commission was a subscriber to this map service and allowed the research team to use the maps in its offices. Using the maps, each census tract was delineated and the planning commission's estimated population indicated for each tract.

The total county population in the 150 tracts was estimated at 738,500 by the planning commission as compared with 625,816 enumerated in the census of 1950. Each census tract was assigned a series of consecutive numbers based on the population estimate for the tract in multiples of 1,000. Thus, a tract with 6,000 population was assigned six numbers, a tract with 4,000 population, four numbers, and so on. Multiples above 500 were counted as an additional thousand and an additional number assigned. Thus, if a tract had 5,637 people it was assigned six numbers.

By this method, a total of 417 numbers were assigned to the 92 census tracts in Westchester County exclusive of Mount Vernon, New Rochelle, and Yonkers. Since 1,000 interviews were required, and in order to have as much geographic dispersion as possible within the county, it was decided to select 25 census tracts and to sample 40 households within each of these 25 tracts. The tracts were selected by choosing a random number and then taking every 44th tract until 25 tracts were so selected.

Apartment developments were treated as units and every household within the apartment building was numbered separately. Interviewers were instructed to keep careful records of all households within their 40 household units and to indicate on the map any additional households found or any absent.

In no case was there a disparity of more than

**Table 2. Household size and sex distribution of sample and 1950 census populations of Rensselaer and Westchester Counties**

Characteristics	Rensselaer County		Westchester County	
	Sample population	1950 census <sup>1</sup>	Sample population	1950 census <sup>1</sup>
Household size-----	3.3	3.3	3.7	3.4
Sex distribution:				
Males-----	48.1	49.2	49.3	47.7
Females-----	51.9	50.8	50.7	52.3

<sup>1</sup> United States Bureau of the Census, 1950 Census of Population, Vol. II: Characteristics of the population, part 32, New York, table 42.

6 households per area, and the average disparity was plus or minus 2 households per 40 unit area.

Interviewing was conducted from April 1 through May 27, 1957, covering 930 households with 3,095 persons in Rensselaer County and 904 households with 3,305 persons in Westchester County.

Following the completion of the interviews there was an attempt to compare the sample population with the general population of the counties in respect to certain demographic characteristics. This was hampered by the lack of recent data on characteristics of the population in both counties. Table 2, however, compares household size and sex distributions of the sample population in each county with the same data for the entire county in the census of 1950, showing a close similarity between the sample population and the general population as described in that year. Other characteristics such as age structure, and occupational and educational structure were also compared. This comparison, while too lengthy for presentation here, once more indicated a close similarity in the demographic structures of the sample population and that of the entire county population.

### Findings

The generally accepted belief that women are more health conscious, or at least receive medical care more consistently than men, seems

County differs markedly from Rensselaer County in that it is composed of numerous large cities and many suburban developments with few genuinely rural areas. Within Westchester County, it was decided to exclude the cities of Yonkers, Mount Vernon, and New Rochelle, each of which operates under a separate health department jurisdiction.

The basic plan of the research was to draw for interview an initial sample of 1,000 households in each of the two counties. A schedule of questions sought data on the poliomyelitis vaccination history of each member of the household, sociocultural characteristics of the sample population, attitudes of the respondent toward reasons for individual members of the household and certain other population groups accepting or not accepting vaccination, and the effects of various media of communication in this decision.

### The Sample

Sampling in the study reported here was based on physical structures within definite geographic boundaries such as counties, cities, city blocks, or grid overlays on accurate maps. Households within these subareas were selected for the sample, the method varying somewhat between the two counties in adaptation to differences in available population and cartographic data.

This area probability technique was an alternative to the ideal method of listing all households in the counties and randomly selecting the desired interviews from among them. However, available source listings, such as directories and telephone books introduce biases because of selectivity in compilation. Also, time and cost requirements are extensive (1).

The major difficulty in setting up the sample in Rensselaer County was the unavailability of recently published census data on the geographic distribution of the population. The most recent census data by incorporated city or village and by township were 6 years old. While it would have been possible to obtain more recent data in the cities and villages, still left unanswered was the question of the population density of the unincorporated rural area of the county. Fortunately, however, estimated

population figures for this area, considered the most accurate for that county, are maintained by the Rensselaer County Health Department. On the basis of these figures, five subsamples were set up in Rensselaer County in order to allow for equal representation of the various types of areas. Subsample A would be Troy, the largest city in the county; subsample B, Rensselaer City; subsample C, the city of Hoosick Falls; subsample D, the four incorporated villages; and subsample E, the remaining unincorporated areas.

The total estimated population of the county was about 142,000 people, and interviews were allocated according to the proportion in each subsample universe of the total estimated population of the county (table 1). Each type of area required somewhat different procedures for selection of the actual households to be interviewed, but each procedure was based upon proportional representation within the county. When the interviewers actually visited every potential dwelling in the sample, it was found that the actual number of households and the estimates prepared by the staff were virtually the same, never varying more than 1 out of 30 households.

**Table 1. Allocation of the sampling interviews in Rensselaer County**

Area	Estimated population	Proportion of estimated total population	Number of interviews allocated
Unincorporated area	48,515	34.1	341
Troy	73,768	51.8	518
Rensselaer	11,262	7.9	79
Hoosick Falls	4,451	3.1	31
All other incorporated villages <sup>1</sup>	4,383	3.1	31
Total	142,379	100.0	1,000

<sup>1</sup> Castleton, Nassau, Schaghticoke, and Valley Falls.

The problem in Westchester County was dissimilar to that in Rensselaer County. In Westchester there were definite boundaries established on the basis of census tract lines. The population of these areas was available for the census of 1950, and the Westchester County Planning Commission had just completed an

**Table 5. Inoculation history of age groups by social position score, Rensselaer County**

Age group and social position score	Total number	Number of doses				Age group and social position score	Total number	Number of doses			
		None		Three or more				None		Three or more	
		Number	Per cent	Number	Per cent			Number	Per cent	Number	Per cent
6 months-39 years						15-19 years					
Total .....	1,851	929	50.3	211	11.4	Total .....	195	120	61.5	9	4.6
I .....	112	30	26.8	21	18.7	I .....	10	3	30.0	1	10.0
II .....	106	35	33.3	24	22.9	II .....	11	7	63.7	0	0.0
III .....	486	230	47.3	70	14.4	III .....	41	27	65.9	3	7.3
IV .....	717	399	55.6	67	9.3	IV .....	84	52	61.9	4	4.8
V .....	424	232	54.7	28	6.6	V .....	48	30	62.5	1	2.1
Not stated .....	8	5	62.5	1	12.5	Not stated .....	1	1	100.0	0	0.0
6 months-4 years						20-29 years					
Total .....	293	64	21.8	75	25.6	Total .....	349	280	80.2	8	2.3
I .....	25	1	4.0	9	36.0	I .....	26	12	46.2	0	0.0
II .....	20	2	10.0	9	45.0	II .....	19	12	63.2	1	5.3
III .....	86	12	14.0	27	31.4	III .....	79	60	75.9	4	5.1
IV .....	102	29	28.4	25	24.5	IV .....	140	121	86.4	3	2.1
V .....	58	19	32.8	4	6.9	V .....	84	74	88.1	0	0.0
Not stated .....	2	1	50.0	1	50.0	Not stated .....	1	1	100.0	0	0.0
5-14 years						30-39 years					
Total .....	598	100	17.0	114	19.0	Total .....	416	365	88.0	5	1.2
I .....	29	3	10.3	11	37.9	I .....	22	11	50.0	0	0.0
II .....	33	1	3.0	12	36.4	II .....	23	13	59.1	2	9.1
III .....	154	20	13.0	34	22.1	III .....	126	111	88.1	2	1.6
IV .....	236	50	21.2	34	14.4	IV .....	155	147	94.8	1	0.6
V .....	144	25	18.5	23	15.8	V .....	88	82	93.2	0	0.0
Not stated .....	2	1	50.0	0	0.0	Not stated .....	2	1	50.0	0	0.0

This male-female difference seems to begin as early as 10 years of age in both counties, and, for poliomyelitis vaccination at least, tends to disappear after age 50.

The children from 6 months of age through 14 years of age in both counties generally had quite high inoculation experience. About 75 percent of the children in this age group received at least one injection. As was expected, it was found that the highest level of vaccination experience was in the age group from 5 to 9 years, of which about 85 percent in Rensselaer and almost 95 percent in Westchester County obtained at least one injection.

After age 15 years, the level of injection dropped sharply and decreased consistently through the life cycle so that after age 50 vir-

tually no one had been vaccinated. In the age groups from 15 through 40, when vaccination against poliomyelitis is still a necessary precaution and was so publicized, between 60 and 80 percent in each county had not obtained any injection.

A comparison of the two counties reveals a consistently higher rate of vaccination in Westchester County throughout all age groups. This is probably explained by the fact that Westchester was in the 1954 field trial and Rensselaer was not. In the 1956 and 1957 vaccine programs, moreover, the Rensselaer County Health Department favored a single injection rather than the complete series while Westchester County encouraged the administration of three doses. This difference is re-

to be true of poliomyelitis vaccination (tables 3 and 4). At all ages from 10 through 39 years, in both counties, a higher percentage of males than females had failed to be vaccinated. This is true even at the younger ages, but as age increased the disparity between male and female rates of vaccination became greater in both counties, reaching a peak in the 20- to 29-year

age group. Two factors probably contribute to this increased difference in the 20- to 29-year age group. This age group contains the women of childbearing age who were given priority and encouraged to obtain vaccination in the poliomyelitis program. These data also seem to reflect a negative attitude to health safeguards on the part of men in this age group.

**Table 3. Inoculation history by age and sex, Rensselaer County**

Age groups	Total number		Number of doses							
			None				Three or more			
	Males	Females	Males		Females		Males		Females	
			Num- ber	Per- cent	Num- ber	Per- cent	Num- ber	Per- cent	Num- ber	Per- cent
Total.....	1, 488	1, 607	1, 064	71. 5	1, 091	67. 9	99	6. 7	113	7. 0
0-6 months.....	15	11	13	86. 7	10	90. 9	0	0. 0	0	0. 0
6 months-4 years.....	146	147	28	19. 2	36	24. 5	33	22. 6	42	28. 6
5-9 years.....	152	183	20	13. 2	27	14. 8	36	23. 7	40	21. 9
10-14 years.....	132	131	27	20. 5	26	19. 8	25	18. 9	13	9. 9
15-19 years.....	106	89	69	65. 1	51	57. 3	3	2. 8	6	6. 7
20-29 years.....	166	183	152	91. 6	128	69. 9	0	0. 0	8	4. 4
30-39 years.....	199	217	189	95. 0	176	81. 1	1	0. 5	4	1. 8
40-49 years.....	228	244	224	98. 2	238	97. 5	1	0. 4	0	0. 0
50-59 years.....	183	195	183	100. 0	195	100. 0	0	0. 0	0	0. 0
60 and over.....	149	196	149	100. 0	196	100. 0	0	0. 0	0	0. 0
Not stated.....	12	11	10	83. 3	8	72. 7	0	0. 0	0	0. 0

**Table 4. Inoculation history by age and sex, Westchester County**

Age groups	Total number		Number of doses							
			None				Three or more			
	Males	Females	Males		Females		Males		Females	
			Num- ber	Per- cent	Num- ber	Per- cent	Num- ber	Per- cent	Num- ber	Per- cent
Total.....	1, 630	1, 675	927	56. 8	902	53. 8	367	22. 6	382	22. 9
0-6 months.....	8	16	8	100. 0	15	93. 8	0	0. 0	0	0. 0
6 months-4 years.....	235	188	22	9. 4	15	8. 0	129	54. 9	107	56. 9
5-9 years.....	173	193	12	6. 9	8	4. 1	115	66. 5	135	69. 9
10-14 years.....	148	111	28	18. 9	14	12. 6	79	53. 4	63	56. 8
15-19 years.....	89	90	41	45. 5	35	38. 9	12	13. 6	20	22. 2
20-29 years.....	158	209	117	74. 1	95	45. 6	6	3. 8	26	12. 4
30-39 years.....	244	274	158	64. 7	159	57. 9	16	6. 6	23	8. 5
40-49 years.....	231	256	207	89. 6	232	90. 6	6	2. 6	5	2. 0
50-59 years.....	178	162	177	99. 4	161	99. 4	0	0. 0	0	0. 0
60 and over.....	138	143	136	98. 5	143	100. 0	0	0. 0	0	0. 0
Not stated.....	28	33	21	75. 0	25	75. 8	4	14. 3	3	9. 1

**Table 7. Inoculation history of age groups by education of chief wage earner, Rensselaer County**

TABLE 7.—*Continued*

Age group and education of chief wage earner	Total number	Number of doses				Age group and education of chief wage earner	Total number	Number of doses			
		None		Three or more				None		Three or more	
		Number	Percent	Number	Percent			Number	Percent	Number	Percent
6 months—39 years						15—19 years					
Total.....	1,851	929	50.2	211	11.4	Total.....	195	120	61.5	9	4.6
Professional.....	105	34	32.4	23	21.9	Professional.....	9	4	44.4	1	11.1
4 yrs. college.....	102	31	30.4	22	21.6	4 yrs. college.....	9	4	44.4	0	0.0
1-3 yrs. college.....	232	94	40.5	34	14.7	1-3 yrs. college.....	14	7	50.0	2	14.3
High school grad.....	556	289	52.0	59	10.6	High school grad.....	162	38	61.3	3	4.8
Part high school.....	314	172	54.8	35	11.1	Part high school.....	36	26	72.2	3	8.3
7-9 yrs. school.....	440	251	57.0	32	7.3	7-9 yrs. school.....	41	23	56.0	0	0.0
0-6 yrs. school.....	101	57	56.4	6	5.9	0-6 yrs. school.....	23	17	73.9	0	0.0
Not stated.....	1	1	100.0	0	0.0	Not stated.....	1	1	100.0	0	0.0
6 months—4 years						20—29 years					
Total.....	293	64	21.8	75	25.6	Total.....	349	280	80.2	8	2.3
Professional.....	21	3	14.3	11	52.4	Professional.....	20	14	70.0	0	0.0
4 yrs. college.....	26	3	11.5	11	42.3	4 yrs. college.....	20	7	35.0	1	5.0
1-3 yrs. college.....	40	4	10.0	10	25.0	1-3 yrs. college.....	40	30	75.0	3	7.5
High school grad.....	91	18	19.8	22	24.2	High school grad.....	105	81	77.1	3	2.9
Part high school.....	44	10	22.7	11	25.0	Part high school.....	52	43	82.7	1	1.9
7-9 yrs. school.....	62	21	33.9	10	16.1	7-9 yrs. school.....	100	93	93.0	0	0.0
0-6 yrs. school.....	9	5	55.6	0	0.0	0-6 yrs. school.....	12	12	100.0	0	0.0
5—14 years						30—39 years					
Total.....	598	100	16.7	114	19.1	Total.....	416	365	87.7	5	1.2
Professional.....	31	3	9.7	11	35.5	Professional.....	24	10	41.7	0	0.0
4 yrs. college.....	28	4	14.3	8	28.6	4 yrs. college.....	19	13	68.4	2	10.5
1-3 yrs. college.....	83	6	7.2	19	22.9	1-3 yrs. college.....	55	47	85.5	0	0.0
High school grad.....	168	32	19.0	29	17.3	High school grad.....	130	120	92.3	2	1.5
Part high school.....	101	17	16.8	19	18.8	Part high school.....	81	76	93.8	1	1.2
7-9 yrs. school.....	144	28	19.4	22	15.3	7-9 yrs. school.....	93	86	92.5	0	0.0
0-6 yrs. school.....	43	10	23.3	6	14.0	0-6 yrs. school.....	14	13	92.9	0	0.0

An examination of the demographic characteristics of the two counties suggested that more than social class position might be involved. In both counties a significant portion of the sample population was over age 40 and consequently not within the age groups given priority and most encouraged to seek vaccination. Also, social class position is partially related to age since education and occupational advancement both require time. As a result, we felt that it would be more realistic to consider only those individuals who were actively encouraged to seek vaccination. Only those age groups in the 6 months to 39 years range were considered. When the data were reex-

amined by age groups, a somewhat different picture was presented (tables 5 and 6).

In Rensselaer County, where the numbers in the upper two social classes were quite small, the inverse relationship between social class and failure to be vaccinated continued, although the pattern was not so consistent as when viewed apart from age. In Westchester, where the numbers of social classes I and II were considerably larger than in Rensselaer County, class II had a higher rate of vaccination than did class I. In class II, in every age group but the 15 to 19 year category the vaccination process had more often been carried to three or more injections than in class I.

flected in our data where a significantly higher proportion of individuals in Westchester County had obtained three or more injections. Equally important is the semirural character of Rensselaer with its older, less educated, and generally lower socioeconomic population than that of Westchester. In fact in all of the characteristics usually associated with higher medical standards, including degree of urbanization, and proximity to metropolitan areas, Westchester is superior to Rensselaer County.

The sample populations in both counties were also classified by social class, using the Hollingshead two-factor index of social position. Each respondent had been asked to identify the chief wage earner in the household and information was obtained on his occupa-

tion and education. This information was weighed individually and then combined to give an "index of social position score." Each member of a household was then assigned to one of five indexes of social position classes, based upon the index score of the chief wage earner of that household.

Most previous studies of poliomyelitis vaccination have found that social class position is one of the most important factors affecting the decision of individuals to be vaccinated (2-6). Such studies have indicated that the higher the socioeconomic status of the individual, the more likely he is to be vaccinated. Our data, without refinement of the samples by age groups, seemed to support this general hypothesis.

Table 6. Inoculation history of age groups by social position score, Westchester County

Age group and social position score	Total number	Number of doses				Age group and social position score	Total number	Number of doses			
		None		Three or more				None		Three or more	
		Number	Percent	Number	Percent			Number	Percent	Number	Percent
6 months-39 years						15-19 years					
Total.....	2, 112	704	33. 3	731	34. 6	Total.....	179	76	42. 5	32	17. 9
I.....	400	94	23. 5	157	39. 3	I.....	10	2	20. 0	3	30. 0
II.....	311	55	17. 7	136	43. 7	II.....	32	4	12. 5	8	25. 0
III.....	643	189	29. 4	239	37. 2	III.....	54	19	35. 2	11	20. 4
IV.....	517	244	47. 2	149	28. 8	IV.....	50	29	58. 0	9	18. 0
V.....	200	108	54. 0	40	20. 0	V.....	29	21	72. 4	1	3. 4
Not stated.....	41	14	34. 1	10	24. 4	Not stated.....	4	1	25. 0	0	0. 0
6 months-4 years						20-29 years					
Total.....	423	37	8. 7	236	55. 8	Total.....	367	212	57. 7	32	8. 7
I.....	113	5	4. 4	65	57. 5	I.....	54	22	40. 7	5	9. 3
II.....	58	6	10. 3	35	60. 3	II.....	36	10	27. 8	8	22. 2
III.....	129	10	7. 8	80	62. 0	III.....	113	53	46. 9	13	11. 5
IV.....	94	13	13. 8	46	48. 9	IV.....	113	87	77. 0	4	3. 5
V.....	24	3	12. 5	8	33. 3	V.....	46	36	78. 3	1	2. 2
Not stated.....	5	0	0. 0	2	40. 0	Not stated.....	5	4	80. 0	1	20. 0
5-14 years						30-39 years					
Total.....	625	62	9. 9	392	62. 7	Total.....	518	317	61. 2	39	7. 5
I.....	112	9	8. 0	74	66. 1	I.....	111	56	50. 5	10	9. 0
II.....	107	6	5. 6	71	66. 4	II.....	78	29	37. 2	14	17. 9
III.....	194	16	8. 2	125	64. 4	III.....	153	91	59. 5	10	6. 5
IV.....	136	19	14. 0	87	64. 0	IV.....	124	96	77. 4	3	2. 4
V.....	57	10	17. 5	28	49. 1	V.....	44	38	86. 4	2	4. 5
Not stated.....	19	2	10. 5	7	6. 8	Not stated.....	8	7	87. 5	0	0. 0

Table 9. Reasons for failure to obtain inoculation, by age, Rensselaer County

Age group	Total number	Too old		Too young		Neglect		Immune		Not necessary for adults		Too expensive	
		Number	Percent	Number	Percent	Number	Percent	Number	Percent	Number	Percent	Number	Percent
Total.....	2, 155	690	32. 0	34	1. 6	682	31. 6	17	0. 8	262	12. 2	97	4. 5
Under 6 months.....	23	0	0. 0	18	78. 3	4	17. 4	0	0. 0	0	0. 0	0	0. 0
6 months-4 years.....	64	0	0. 0	16	25. 0	28	43. 8	0	0. 0	0	0. 0	10	15. 6
5-9 years.....	47	0	0. 0	0	0. 0	14	29. 8	1	2. 1	0	0. 0	14	29. 8
10-14 years.....	53	0	0. 0	0	0. 0	17	32. 1	3	5. 7	0	0. 0	10	18. 9
15-19 years.....	120	0	0. 0	0	0. 0	61	50. 8	3	2. 5	4	3. 3	10	8. 3
20-29 years.....	280	10	3. 6	0	0. 0	189	67. 5	1	0. 4	29	10. 4	13	4. 6
30-39 years.....	365	25	6. 8	0	0. 0	177	48. 5	5	1. 4	54	14. 8	26	7. 1
40-49 years.....	462	195	42. 2	0	0. 0	104	22. 5	1	0. 2	68	14. 7	11	2. 4
50-59 years.....	378	222	58. 7	0	0. 0	47	12. 4	1	0. 3	58	15. 3	3	0. 8
60 and over.....	345	229	66. 4	0	0. 0	37	10. 7	2	0. 6	48	13. 9	0	0. 0
Not stated.....	18	9	50. 0	0	0. 0	4	22. 2	0	0. 0	1	5. 6	0	0. 0

Age group	Total number	Cutter incident program problems		Vaccine shortage		Don't believe in shots, afraid of needles		Didn't know they were available		Conflicts with other medication		Not stated	
		Number	Percent	Number	Percent	Number	Percent	Number	Percent	Number	Percent	Number	Percent
Total.....	2, 155	53	2. 5	39	1. 8	92	4. 3	142	6. 6	25	1. 2	22	1. 0
Under 6 months.....	23	0	0. 0	0	0. 0	0	0. 0	0	0. 0	1	4. 3	0	0. 0
6 months-4 years.....	64	1	1. 6	0	0. 0	4	6. 3	1	1. 6	3	4. 7	1	1. 6
5-9 years.....	47	7	14. 9	0	0. 0	7	14. 9	1	2. 1	3	6. 4	0	0. 0
10-14 years.....	53	11	20. 8	1	1. 9	6	11. 3	2	3. 8	3	5. 7	0	0. 0
15-19 years.....	120	7	5. 8	3	2. 5	19	15. 8	7	5. 8	2	1. 7	4	3. 3
20-29 years.....	280	4	1. 4	4	1. 4	9	3. 2	13	4. 6	2	0. 7	6	2. 1
30-39 years.....	365	8	2. 2	17	4. 7	9	2. 5	35	9. 6	4	1. 1	5	1. 4
40-49 years.....	462	9	1. 9	8	1. 7	20	4. 3	41	8. 9	1	0. 2	4	0. 9
50-59 years.....	378	4	1. 1	6	1. 6	10	2. 6	23	6. 1	4	1. 1	0	0. 0
60 and over.....	315	0	0. 0	0	0. 0	8	2. 3	17	4. 9	2	0. 6	2	0. 6
Not stated.....	18	2	11. 1	0	0. 0	0	0. 0	2	11. 1	0	0. 0	0	0. 0

civic organizations" (7). There is considerable evidence among sociologists that it is the "next to the highest" or "striving" social class which becomes involved in community-centered programs rather than the highest social class (8-10).

Another possible explanation is that education beyond a certain point operates to reduce readiness to accept health improvement programs. College graduates and the "striving" upper middle class may not be marked with the cynicism which often seems a part of the value orientation of the highest educational and occupational strata. Whatever the reasons for this difference, the data do seem to suggest that it is the value orientation of a particular

educational or occupational stratum which figures in its readiness to accept vaccination, rather than social class or education alone.

We were also interested in determining why people had failed to receive vaccinations, and so we asked the respondent why each nonvaccinated member of the household had not been vaccinated. Reasons most commonly given were those reported in similar studies (11); advanced age, neglect, forgetfulness, and procrastination (tables 9 and 10). The most frequent reason was "too old" which, if combined with the similar response of "vaccination is not necessary for adults," accounted for about 4.5 percent of all reasons given in both counties. Here again we wanted to see if certain re-



These same age groups had been stratified by the education of the chief wage earner and each grouping compared in terms of vaccination status (tables 7 and 8). Again we found that, in general, as has usually been found in similar studies, the level of vaccination tended to increase with increase in education. In both counties, however, the 4-year college graduates had a generally higher rate of vaccination than did the "professional" individuals, with some postgraduate college education.

Our data appear to show, then, that there is no simple relationship between readiness to obtain vaccination and social class and educa-

tion, that perhaps more than just education and class position are factors in the generally observed improvement in vaccination experience as education and class position increase. One explanation may be that we are dealing with essentially the same people in social class II and education class II since education is an important component in computing social class. Perhaps in both cases we are describing the younger, community-centered college graduate and his family of the upper middle class who have been described by sociologists as "hyperactive in community affairs" and holding "three-fourths of all positions of leadership in

**Table 8. Inoculation history of age groups by education of chief wage earner, Westchester County**

Age group and education of chief wage earner	Total number	Number of doses				Age group and education of chief wage earner	Total number	Number of doses			
		None		Three or more				None		Three or more	
		Number	Percent	Number	Percent			Number	Percent	Number	Percent
6 months-39 years						15-19 years					
Total.....	2, 112	704	33. 3	731	34. 6	Total.....	179	76	42. 5	32	17. 9
Professional.....	428	89	20. 8	162	37. 9	Professional.....	22	3	13. 6	4	18. 2
4 yrs. college.....	301	62	20. 6	131	43. 5	4 yrs. college.....	22	3	13. 6	5	22. 7
1-3 yrs. college.....	253	84	33. 2	88	34. 8	1-3 yrs. college.....	22	12	54. 5	3	13. 6
High school grad.....	631	217	34. 4	230	36. 5	High school grad.....	43	15	34. 9	10	23. 3
Part high school.....	162	67	41. 4	50	30. 9	Part high school.....	13	7	53. 8	4	30. 8
7-9 yrs. school.....	227	120	52. 9	51	22. 5	7-9 yrs. school.....	34	22	64. 7	5	14. 7
0-6 yrs. school.....	87	53	60. 9	19	21. 8	0-6 yrs. school.....	19	13	68. 4	1	5. 3
Not stated.....	23	12	52. 2	0	0. 0	Not stated.....	4	1	25. 0	0	0. 0
6 months-4 years						20-29 years					
Total.....	423	37	8. 7	236	55. 8	Total.....	367	212	57. 8	32	8. 7
Professional.....	114	8	7. 0	71	62. 3	Professional.....	70	23	32. 9	9	12. 9
4 yrs. college.....	65	2	3. 1	37	56. 9	4 yrs. college.....	35	14	40. 0	8	22. 9
1-3 yrs. college.....	43	5	11. 6	22	51. 2	1-3 yrs. college.....	45	22	48. 9	4	8. 9
High school grad.....	134	14	10. 4	82	61. 2	High school grad.....	106	68	64. 2	6	5. 7
Part high school.....	30	2	6. 7	11	36. 7	Part high school.....	31	17	54. 8	3	9. 7
7-9 yrs. school.....	30	5	16. 7	10	33. 3	7-9 yrs. school.....	59	47	79. 7	2	3. 4
0-6 yrs. school.....	5	1	20. 0	3	60. 0	0-6 yrs. school.....	18	18	100. 0	0	0. 0
Not stated.....	2	0	0. 0	0	0. 0	Not stated.....	3	3	100. 0	0	0. 0
5-14 years						30-39 years					
Total.....	625	62	9. 9	392	62. 7	Total.....	518	317	61. 2	39	7. 5
Professional.....	110	7	6. 4	71	64. 5	Professional.....	112	48	42. 9	7	6. 2
4 yrs. college.....	103	4	3. 9	67	65. 0	4 yrs. college.....	76	39	51. 3	14	18. 1
1-3 yrs. college.....	79	6	7. 6	52	65. 8	1-3 yrs. college.....	64	39	60. 9	7	10. 9
High school grad.....	187	17	9. 1	124	66. 3	High school grad.....	161	103	64. 0	8	5. 0
Part high school.....	46	7	15. 2	31	67. 4	Part high school.....	42	34	81. 0	1	2. 4
7-9 yrs. school.....	67	15	22. 4	33	49. 3	7-9 yrs. school.....	37	31	83. 8	1	2. 7
0-6 yrs. school.....	25	4	16. 0	14	56. 0	0-6 yrs. school.....	20	17	85. 0	1	5. 0
Not stated.....	8	2	25. 0	0	0. 0	Not stated.....	6	6	100. 0	0	0. 0

Rensselaer County also had a much higher rate of response for "didn't know they were available" and for reasons associated with the safety of the vaccine such as the Cutter incident. Once again the generally lower educational and cultural level of this county would seem to explain these differences.

### Summary and Conclusions

After assigning individuals drawn from two counties by area probability sampling techniques into various age, sex, socioeconomic, and educational strata, we have attempted to find out if there are any differences in poliomyelitis vaccination status which might be related to these characteristics.

Females, even at the younger ages, had a higher rate of vaccination than males, the greatest difference occurring in the age group from 20 to 29 years of age. Our interpretation is that, while it probably reflects the emphasis and priority placed upon the importance of pregnant women being vaccinated, it also represents a masculine resistance to health safeguards, particularly in this age range. This suggests that other health improvement programs must overcome the cultural value which results in the virile young male not seeking health safeguards to the same extent as children or females.

The common belief that poliomyelitis is essentially a children's disease is also reflected in our data, for there is a definite, observable drop in the level of vaccination after age 15 and up to age 40 despite the advertised susceptibility of this age group. Evidently the posters showing child victims and the name "infantile paralysis" have been more effective in establishing attitudes toward contracting the disease than have been the health education techniques designed to encourage vaccination of teenagers and adults to age 40. These findings indicate that it is not enough to tell people that they are in danger of contracting a specific disease. Public health efforts should consider specific motivational factors and the unlearning of established attitudes.

Westchester County, which is socially, economically, and culturally superior to the more rural county of Rensselaer, also had a higher

rate of vaccination at all age levels. This is true not only of first injections but is even more evident in the proportion of individuals who receive three or more injections. Some of this difference is undoubtedly due to the emphasis in the Westchester County program on the necessity of three injections for immunization as contrasted with the single-injection immunity approach in Rensselaer, but the socioeconomic and educational differences between the two counties are also factors.

These differences in participation by members of various social strata are also apparent within each of the two counties. As had been found in most similar studies, the higher the social class position and education, the higher the level of vaccination experience. Our data also indicate, however, that among individuals in the susceptible age range who were encouraged to seek vaccination, it is not the highest social class but rather the second highest which generally showed the highest level of vaccination. Similarly, it was the 4-year college graduate rather than the postcollege graduate group which had the highest vaccination level.

We cannot state definitely that these differences are universal for, while they appeared in both of these dissimilar counties, they may not be true elsewhere. Neither can we be certain that these differences reflect actual differences in behavior, for, while they appear consistently throughout our data, we are dealing with such small numbers in the two highest groups that chance factors may be involved. We believe, however, that they are indicative of the tendency, described by sociologists, of the upper middle class to become more involved in community-centered activities than the less "striving" highest socioeconomic and educational groups. This underscores the hypothesis that it is the value orientation of a particular stratum rather than its ability to pay or educational competence which underlies differences in readiness to participate in health improvement programs.

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sponses were more frequent in particular age groups. For example, were those who said they were "too old" actually in the over-age-40 group? Our data show that while "too old" as a reason for failure to obtain vaccination is most commonly given after age 40, a large proportion of the age group from 20 to 39 years of age gave this response again despite the fact that they were the target of vaccination programs.

The reasons centering around apathy or neglect were most frequently given in the 15-29 year age group. In most cases the response was meant to convey the idea that the individual had nevertheless realized he should be vac-

inated. In a separate question we asked the respondent's opinion as to why most teenagers had not been vaccinated. Here the laxity was assigned to the parents; in about 25 percent of the cases in both counties the response was that parents were too lax or disinterested. A later analysis indicated that this reason was given as often by respondents who had teenagers in the household as by those who did not.

The economic and educational differences between the two counties also are reflected in some of the reasons given for nonvaccination. "Too expensive" was given as a reason three times oftener in the less economically developed county of Rensselaer than in Westchester.

**Table 10. Reasons for failure to obtain inoculation, by age, Westchester County**

Age	Total number	Too old		Too young		Neglect		Not necessary for adults		Too expensive	
		Number	Per-cent	Number	Per-cent	Number	Per-cent	Number	Per-cent	Number	Per-cent
Total.....	1, 829	676	36. 5	37	2. 1	695	38. 1	167	9. 2	25	1. 3
Under 6 months.....	23	0	0. 0	23	100. 0	0	0	0	0. 0	0	0. 0
6 months-4 years.....	37	0	0. 0	14	39. 5	11	28. 9	0	0. 0	0	0. 0
5-9 years.....	20	0	0. 0	0	0. 0	8	42. 9	0	0. 0	1	4. 8
10-14 years.....	42	1	2. 3	0	0. 0	17	39. 5	0	0. 0	0	0. 0
15-19 years.....	76	1	1. 3	0	0. 0	55	72. 4	2	2. 6	3	3. 9
20-29 years.....	212	4	1. 4	0	0. 0	164	77. 6	15	7. 1	4	1. 9
30-39 years.....	317	25	6. 4	0	0. 0	197	63. 0	35	11. 3	7	2. 3
40-49 years.....	439	221	50. 5	0	0. 0	122	27. 9	46	10. 5	7	1. 4
50-59 years.....	338	214	63. 0	0	0. 0	67	20. 0	35	10. 4	0	0. 0
60 and over.....	279	195	69. 6	0	0. 0	38	13. 8	28	10. 1	2	0. 7
Not stated.....	46	15	30. 0	0	0. 0	16	32. 0	6	12. 0	1	2. 0

Age	Total number	Cutter incident program problems		Vaccine shortage		Don't believe in shots, afraid of needles		Didn't know they were available		Conflicts with other medication		Not stated	
		Number	Per-cent	Number	Per-cent	Number	Per-cent	Number	Per-cent	Number	Per-cent	Number	Per-cent
Total.....	1, 829	7	0. 4	41	2. 3	76	4. 2	37	2. 0	26	1. 4	42	2. 6
Under 6 months.....	23	0	0. 0	0	0. 0	0	0. 0	0	0. 0	0	0. 0	0	0. 0
6 months-4 years.....	37	1	2. 6	1	2. 6	0	0. 0	0	0. 0	5	13. 2	5	13. 2
5-9 years.....	20	0	0. 0	0	0. 0	4	19. 0	2	9. 5	4	19. 0	1	4. 8
10-14 years.....	42	2	4. 7	1	2. 3	14	32. 6	2	4. 7	3	7. 0	2	7. 0
15-19 years.....	76	1	1. 3	1	1. 3	7	9. 2	0	0. 0	2	2. 6	4	5. 3
20-29 years.....	212	1	0. 5	2	1. 0	7	3. 3	5	2. 4	3	1. 4	7	3. 3
30-39 years.....	317	0	0. 0	18	5. 8	18	5. 8	5	1. 6	6	1. 9	6	1. 9
40-49 years.....	439	2	0. 5	13	3. 0	14	3. 2	6	1. 4	3	0. 7	5	1. 1
50-59 years.....	338	0	0. 0	3	0. 9	6	1. 8	8	2. 4	0	0. 0	5	1. 5
60 and over.....	279	0	0. 0	0	0. 0	5	1. 8	7	2. 5	0	0. 0	4	1. 4
Not stated.....	46	0	0. 0	2	4. 0	1	2. 0	2	4. 0	0	0. 0	3	14. 0

# Does Better Health Pay?

BURTON A. WEISBROD, Ph.D.

**I**MPROVED HEALTH is desirable. But so is improved housing, so are improved highways, flood control, recreation facilities, and so on, through an almost interminable list of the things people wish to have. Unfortunately, we cannot have everything we want. We must decide which goods and services to forego as well as which to consume. We must economize—that is, we must get the most from our limited resources. While it is frequently asserted that health and life are moral issues, beyond considerations of cost, it is clear that in our daily behavior we seldom treat them as such. We eat too much, sleep too little, work too hard, and drive too fast. We do so because there are many things we desire, and sometimes, in order to enjoy more of one, we must sacrifice another.

To make choices in a rational manner requires estimation of the relative importance of the various alternatives. If reducing the incidence of disease is more important than building new highways to speed traffic, then, perhaps, a convincing case may be made for increasing health expenditures (and decreasing those on highways). With this general possibility in mind, increasing attention has come to be paid to estimating in money terms the real importance of good health—or, what is the same thing, estimating losses from poor health. (In this paper the terms, “losses from poor health” and “costs of poor health” will be used synonymously.) In many cases, estimates of losses from disease have involved questionable, misleading, or, simply incorrect procedures. It is the objective of this paper to present and analyze exam-

ples of the shortcomings of some attempts to quantify losses attributable to poor health.

## Whose Loss

Studies of economic losses attributable to illness have seldom bothered to answer the question, “losses to whom?” Depending on the answer, losses may vary greatly. To illustrate: according to one recent study, the “total cost of tuberculosis” includes compensation payments to “individuals or to their relatives or dependents because of death or disability caused by tuberculosis” (1). Another study includes pensions to tuberculous veterans as a cost, to the United States, of the diseased (2a). To be sure, such payments are “costs” to the givers, but to the entire society they merely represent transfers of money. As such, compensation payments are not costs to the society as a whole any more than payment of an allowance by a father to his son is a cost to the family, though it is a cost to the father.

What is fundamentally involved here is the distinction between real costs and transfer payments. From the point of view of the entire society, real costs exist to the extent that resources (natural, capital, human) are used up. Of course, we may measure the value of the resources used as X dollars; but while the dollars measure the cost, the real cost is the resource which was used up.

On the other hand, if person A merely makes a payment (be it called gift, subsidy, compensation, or transfer) to B, no resources are used up in the process. Thus, we see that costs, real costs, that is, and money expenditures are not synonymous terms. There may be expenditures without real, or social, costs. And there may be

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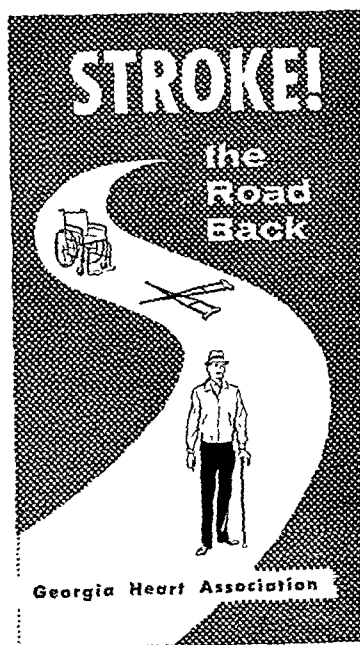
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### *Stroke Information In Georgia Leaflet*



#### **HEALTH EDUCATION CASE HISTORY**

"Strike Back at Stroke," the Public Health Service publication used by physicians for prescribing exercises for stroke patients, is featured in a folder published by the Georgia Heart Association in a campaign for assisting stroke victims. Several medical students, engaged by the association to interview physicians about their experience with stroke patients, reported a large proportion, if not a majority, of the physicians were familiar with the publication, "Strike Back at Stroke," and many were enthusiastic about it. They reported no information, however, on the physician's experience with the use of the publication.

ization and division of labor, the absence of one worker may drastically reduce the productivity of others. Further, uncertainty regarding the daily volume of absences creates for many firms the necessity of employing extra, standby workers who, on days when the rate of absenteeism is low, will not be needed, and will contribute little to output.

Another commonly overlooked form of loss from disease is what we may term "avoidance costs." Even were there no cases of some disease, it would not necessarily be a valid inference that the social losses from that disease were zero. It might be that the incidence was being held down by the taking of costly steps to avoid it.

Where environmental conditions contribute to a disease such as malaria, avoidance costs may go undetected. On the island of Sardinia, where malaria had been endemic until the recent mosquito-eradication program, many farmers adjusted to the threat of malaria by living as much as an hour's walk from their farms. The fertile farmlands were located near swampy, mosquito-breeding areas; the mosquitoes were not troublesome during the day, when the fields were being worked, but the mosquitoes rose at dusk, and so it was not healthful to live near the fields. In this example, the avoidance cost attributable to malaria was the unproductive time and effort devoted to commuting (3b).

#### *Demographic Factors*

Disease affects the size and composition of the population with respect to age, sex, and location through effects on mortality. Economic effects of a children's disease may differ substantially from those of a disease which primarily affects persons of middle and old age. Such matters as the consequences for living standards of (a) variation in proportion of the population in the labor force, and (b) change in the absolute size of the labor force (relative to the supply of land and capital resources) are relevant to a complete identification of the social consequences of disease.

The difficulties of dealing with many of these factors are substantial. But, while one may be forgiven for not delving deeply into the quantitative aspects of population change,

avoidance costs, and absenteeism, he cannot be excused for failing to recognize their relevance in any estimate of the magnitude of social losses from illness.

An additional real cost component which ought not be overlooked, although we can do little more than mention it, is an affliction's intangible, emotional effect on friends and family as well as on the patient himself. It is a mistake, however, to conclude, as a number of writers have, that these effects take the matter of determining the appropriate level of health expenditures out of the realm of economic analysis. It is easy to say: "We have the knowledge and the necessary resources for the control of disease. Obviously, we must put our knowledge to work" (c). We also have the knowledge and resources to eliminate malnutrition, to abolish slums, to greatly improve education—but we do not have the resources to do everything we like. Thus a choice becomes unavoidable: we choose which things we will accomplish (and which we will not). Calling health a moral issue does not alter this necessity of an economic choice.

#### **Measuring Direct Expenditures**

Even if one identifies those losses (costs) attributable to disease which do not involve direct expenditures of money, and even after it is clear what forms the real costs of illness may take, there remain thorny tasks of measurement. Discussing the cost of a mass X-ray program of disease detection, one study reported, in 1947, an estimated ". . . cost of 25 cents a film for each person X-rayed . . ." (2b). This figure appeared to represent the out-of-pocket (marginal) cost of X-raying a person, once the equipment and personnel were available. However, the large increase in the X-ray program proposed in the study would require considerable additional equipment and workers; hence, the cost of X-raying would include a portion of the cost of securing the necessary extra machinery and labor, as well as the cost of the film and its processing. If the 25-cent figure did represent only the out-of-pocket cost of the film, its processing and handling, it seriously understated the extra costs which would be incurred were the tuberculosis eradication

social costs without expenditures. This will be discussed below.

Failure to recognize both of these possibilities is a common source of error. Compensation payments are unilateral transfers of funds, and, as such, do not represent resources used. They do represent the value of resources changing hands, but there are no fewer resources available to the society after the payment than there were before. Thus, the payments (expenditures) do not represent real costs to society.

### Costs Without Expenditures

Although it is apparent that all expenditures do not represent real costs for the society as a whole, it is less obvious that there may be costs even though there are no expenditures. Social costs not reflected by expenditures take a number of forms.

#### *Direct Production Loss*

"Tuberculosis: Why Not Get Rid of It?" is the question raised in one study (2a). Statistical evidence was offered to demonstrate the good return which would result were tuberculosis eradicated in the United States. But the case was weakened by the omission of the value of production lost because of morbidity and mortality caused by tuberculosis. This loss is no less real nor less important than the losses which were reflected by payments of money—care of the ill, casefinding, and medical research.

Production lost as a result of disease is almost as difficult to measure as it is important. In particular is this true for housewives' production. While earnings of men may be reasonable estimates of the value of their contributions to output, there is no equally useful measure available of the value of household services performed by housewives. I have recently attempted, in a tentative manner, to place a value on household production by women at various ages (3a). Another author, Fein, recognized his failure to consider the matter, but explained the omission on grounds of the difficulty involved (4).

In rationalizing his exclusion of the value of housewives' services, Fein points out that they are also excluded from our national income and

product accounts. This is correct, though the reason for the exclusion is, again, the practical difficulty of measurement; at the conceptual level it is clear that household production should be counted as part of total national production.

Regardless of whether the production lost is owing to mortality of males or of females, there is further the question of whether the loss should be considered net of consumption, or as gross (total) production lost. There is no correct choice! Using gross production (earnings) lost has the practical advantages of requiring fewer computations and making unnecessary the estimation of "consumption." On the conceptual level, the issue is, namely, when we measure losses, whose losses are we concerned with? The production lost to the entire population (setting aside other forms of loss) when a person dies is the total of whatever he would have produced; the production lost to the surviving population, rather than the entire population, is the value of whatever he would have produced minus the value of what he would have consumed. It is this difference which is lost to the remainder of society. The latter approach would, of course, show a smaller loss than the former. If a good case can be made for increasing expenditures on control of a disease using net figures, then, a fortiori, a good case for increasing expenditures could be made if the gross production-loss figures were used. Fein (4) used the "gross loss" approach: the "net loss" approach, in different forms, was used by Reynolds (5) and Weisbrod (3).

#### *Indirect Losses*

Disease causes at least several other forms of real social losses which, because they are not reflected by money expenditures, are often overlooked. They are complex, and the absence of money expenditures has made appraisal of their impact difficult. By no means does this imply that they are quantitatively insignificant.

One is the indirect effect of sickness on the productivity of the healthy. Temporary absence from work (much of which results from illness) necessitates certain adjustments of the production process which make the total cost of illness greater than the cost to the ailing worker. In an economy of widespread special-

*A charter member of the American College of Preventive Medicine calls upon his colleagues to take a more active interest in the control of industrial forces damaging to public health.*

# The Occupational Health Challenge to Preventive Medicine

HUNTINGTON WILLIAMS, M.D., Dr.P.H.

IT IS a satisfaction to note that our American College of Preventive Medicine is now 5 years old. Our distinguished roster of members includes a fair number of top administrative physicians in State and local health departments and an occasional industrial hygienist who have played their part in providing health protection for sizable groups of employed persons whether in mine, mill, factory, on a farm, or in an office.

But most of our members must feel that they are remote from any responsibility in this field of endeavor. And it is to them that I would prefer to address my chief emphasis in these remarks.

Our college members who are not industrial hygienists per se have a need to feel that they can and should play an important role in the occupational health needs of their own State or locality.

How well is this work being done in your area? Is it getting enough in the budget? Is there enthusiasm for it at the top level? Would not its chief administrator welcome some support and encouragement from you? Remember that not many years ago very little was being done, and the successful programs of today began pretty much on a shoestring. Does this seem unexciting, or are you too busy with your own work? Is adult health protection less im-

portant than a school health program? What about air pollution control, or radiological health protection, or lead paint poisoning among 2-year-olds in the slums? You might be surprised to find that the man in charge would welcome some show of interest from you. You have a part to play if you are really interested in preventive medicine.

Dr. James M. Mackintosh of London, writing on trends of opinion about public health in England during the first 50 years of this century, said: "One broad feature which forms a background to the whole 50 years may be mentioned at this point; everyone says that prevention is better than cure, and hardly anyone acts as if he believes it, whether he is attached to Parliament, central or local government, or the commonalty of citizens. Palliatives nearly always take precedence over prevention, and our health services today are too heavily loaded with salvage. Treatment—the attempt to heal the sick—is more tangible, more exciting, and more immediately rewarding, than prevention."

Some 3 years ago, Sir Allen Daley, formerly medical officer of health, London County Council, and I presented a paper on "Public Health Practice: An Ounce of Prevention Is Worth a Pound of Cure," in which we quoted Dr. Mackintosh's statement (1). We asserted then that "if the health department [and for the moment you are all included in the health department] does not pay prime attention to prevention and avoid spending too much of its energy on administering curative medical services, no other agency in government will cultivate the great

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*Dr. Williams, commissioner of health, Baltimore, Md., presented this paper before the American College of Preventive Medicine at the 87th annual meeting of the American Public Health Association, Atlantic City, N.J., October 22, 1959.*



campaign, with its 20 million X-rays per year, to be carried out.

### Conclusion

In this paper I have attempted to catalog factors to consider in discussions of losses from illness and costs of improving health. Three general points are stated.

- Expenditures do not always represent real costs to society.

- Even where there are no expenditures, there may be real costs to society.

- Expanding health and medical facilities may frequently increase unit costs.

To increase expenditures for public health may well be good business, but the economics employed in arguing the case can be strengthened. Sound economic analysis will have a greater cogency in the original statement, and the subsequent experience will be more likely

to earn respect for the acumen of the health official, as predictions prove accurate.

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- (5) Reynolds, D. J.: The cost of road accidents. *J. Royal Statistical Soc., series A*, 119: 393-408 (part 4, 1956).
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## Status of Fluoridation in Community Water Supplies

At the close of 1959, some 1,878 communities, supplied by 1,048 water systems, had adopted fluoridation to help reduce the heavy national burden of dental decay. In these communities, there are 36,199,047 people receiving the benefits of this health measure.

During 1959, 77 communities with a total population of 806,880 adopted fluoridation. The majority of this number was made up of small cities and towns scattered throughout the country. However, considering that 93 percent of all communities are 10,000 or less in population size, a great many small cities and towns do not have fluoridation. By the end of 1959, the percentage of all communities that had adopted fluoridation was as follows: population over 500,000, 61 percent; 500,000-100,000, 35 percent; 100,000-10,000, 34 percent; and under 10,000, 8 percent.

Of the estimated 118 million people in the United States provided water from community supplies, 43 million drink water containing at least 0.7 parts per million of fluoride. Of these 43 million persons, 36,199,047 are supplied water containing fluoride concentrations adjusted for optimum dental benefits; and 7 million people use water naturally containing 0.7 parts per million or more fluoride.

ments, chiefly in regard to the proper posting of "hot areas" or the keeping of records. These conditions were corrected.

At the request of the Baltimore Department of Public Works, the health department began monthly monitoring of the radiation activity of the three city sources of water supply and the effluents of the two sewage disposal plants. Like the earlier air monitoring, these new checks are to establish baselines of information. These services will be continued.

*Shoe-fitting machines.* City Ordinance No. 1518, approved June 25, 1958, prohibits any person from maintaining or operating in Baltimore any fitting devices or machines which use fluoroscopic, X-ray, or radiation principles, for the purpose of fitting shoes in connection with the sale of footwear. Inspection revealed that all shoe-fitting machines were removed, or 45 machines from 43 shoe stores, attaining complete compliance.

*Lead and silversmithing.* A survey was conducted at two local silversmithing plants after a lead hazard was discovered in the Massachusetts silversmithing industry. Samples of dust from the sand-bobbing operation indicated no significant employee exposure to lead.

*Formaldehyde eye irritation.* Employees of two clothing stores complained of eye irritation. As in previous years, investigation showed that these irritations, which occur during warm weather, were caused by dust from cloth treated at the mills with a formaldehyde preparation in order to make the material wrinkle and shrink resistant. Installation of exhaust ventilation removed the cause of the eye irritation.

*Court actions.* During the year, court action was instituted against the owner of a drycleaning establishment who failed to provide adequate controls to prevent industrial surface drainage, and against the owner of an automobile repair garage who failed to provide adequate exhaust ventilation. Corrections were made in both instances.

*Firefighters and carbon monoxide.* Firefighters became ill while battling a blaze at a chemical plant, and the bureau was requested to investigate since there was speculation that the fire created hazardous airborne chemicals. It was apparent that the fire started in an air-

locked enclosure where paper bags and an inert ore, manganese dioxide, were stored. Combustion of the paper in the oxygen-starved air formed carbon monoxide. A sample of ore removed from the fire area showed that sufficient gas had been adsorbed by its surface to give a positive reaction for carbon monoxide.

## Planning for the Future

Closely related to industrial hygiene and the prevention of the occupational diseases is the equally interesting and persistent present-day challenge of air pollution. Health departments long ago concerned themselves with the disposal of solid wastes and, more recently, with liquid wastes. How long will the public be content to watch the health officer in an industrial area sit by and take no part in the control of the purity of the air the citizen must breathe?

Let us look at a riverside industrial city that backed away from the problem of air pollution, or rather, did not approach it at all. A group of new industries moved into this community. For local, nearsighted, fiscal, and other reasons, the new plants were located directly to windward of the residential areas. The city officials soon knew and the whole city knew that they had not planned and built properly. Rather they had created for themselves the curative and expensive task of air pollution control, a task that could and should have been prevented. This is an aspect of town planning which does not always receive the attention it deserves.

Granted that these industrial controls constitute a difficult task; but what a challenge it is to preventive medicine and how rewarding you will find it if you let your interest increase and you become a part of it.

*The technical studies are described in detail in the 1958 annual report by Charles E. Couchman, director of the Baltimore Bureau of Industrial Hygiene. The annual report is available upon request.*

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- (1) Williams, H., and Daley, A.: Public health practice: An ounce of prevention is worth a pound of cure. Baltimore Health News 33: 41-60, June-July 1956.

untilled fields of preventive medicine." And we questioned whether the warning voiced by Dr. Mackintosh would be heeded.

We then discussed in some detail four untilled or partially tilled fields of prevention: mental hygiene, industrial hygiene, air pollution, and health education. Surely you will all agree that industrial hygiene or occupational health is a most important area of preventive medicine. Whatever your own major field of endeavor, you can play a part in improving the occupational health status of your community, if you will let yourself become intrigued a bit about it.

In many State health departments and in a number of the larger city health departments in the United States, a fair amount of inspection, abatement, and control service is done in protecting the health of industrial workers, but not nearly as much as could and should be done. As an example, in Baltimore, a city of about 986,000 persons, there is a lively program that has been built up over more than 30 years into a bureau of industrial hygiene and its specialized staff. This staff of 15 is made up of a highly qualified physician, Dr. R. R. Sayers, formerly in charge of all this work in the Public Health Service, 2 chemical engineers and 2 civil engineers, 2 expert laboratory chemists, 5 special inspectors, a public health nurse, and 2 stenographers.

The Baltimore City Health Department in the 1920's was called on to investigate complaints and occasional known cases of occupational disease. In 1925, the city passed a strong gas appliance ordinance and placed responsibility for its enforcement with the health department. There had been too many deaths from faulty gas equipment and tubing. A State law later made it mandatory for physicians to report all cases of occupational disease to the local health department which, in turn, was directed to study and control such causes of death or illness and adopt regulations for their prevention.

At first, plant management was skeptical of visits from the health department, but, little by little, confidence was established and real service was provided on a consultation basis. Today one plant's manager tells another to call for this highly qualified and protective guidance. The local medical profession has aided

greatly in developing this spirit of teamwork. Local industrial leaders of top rank in Baltimore now expect the city health department to concern itself with these matters. In fact, their Association of Commerce has established special health committees for self-policing and for co-operative health activities. The commissioner of health and his staff serve on these committees in an ex officio capacity.

### Technical Studies

In 1958, among 56 technical studies made of toxic materials used in Baltimore industries, 8 may be mentioned as characteristic.

*Foundry studies.* Dust studies were made in five nonferrous foundries. The dust counts ranged from  $1.5 \times 10^6$  to  $19.7 \times 10^6$  particles per cubic foot of air. The sand preparation and the shakeout operation areas were indicated as needing attention. Management was notified to supply approved respirators for employees in dusty areas, to maintain and check the functioning of exhaust systems, and to minimize dust on floors traversed by mobile equipment. These suggestions were carried out.

*Mercury float bed.* Upon request, a "mercury float bed," located at the ballistocardiographic laboratory of a large hospital, was investigated for possible emission of mercury vapor. The patients lie on an aluminum tray which floats on the mercury. The motion of the tray, caused by blood flow and breathing, is measured, and electrocardiograms and phonograph records of the heartbeat are taken. Patients do not come in contact with the mercury, which has a silicone oil film to reduce vaporization. The study revealed the presence of mercury in the trap of a sink located in the room. The removal of a few cubic centimeters of mercury from the trap and additional cleanup procedures corrected the condition.

*Radiation control.* Investigation of 45 radioisotope users revealed that the isotopes are used in the medical field for research, diagnosis, and treatment; in the industrial field for radiography and density gauge measurements; and in the educational field for research. In general, all users were found to be handling the isotopes safely, except for an occasional deviation from Atomic Energy Commission require-

# The Work of Selwyn D. Collins

Selwyn D. Collins was a pioneer in the collection and analysis of statistical information on the health status of the general population. He created not only an important body of new statistics about the common human ailments but also new techniques for obtaining such statistics, new terminology for describing them, and new methods for analyzing them.

Almost all of Dr. Collins' working life was devoted to quiet, unostentatious research in his chosen field of interest. In 1920, his first position in the Public Health Service was that of statistician on the staff of Edgar Sydenstricker, one of this country's foremost epidemiologists. Mr. Sydenstricker and Dr. Goldberger had been using interviews to show the statistical association between pellagra and dietary deficiency in the classic South Carolina Mill Villages Study. It was undoubtedly Sydenstricker's use of community interview surveys of the general population that stimulated Dr. Collins' interest in this method.

During this early period Dr. Collins also had close and frequent contact with Dr. Wade Hampton Frost, an outstanding epidemiologist and an associate of Sydenstricker. Dr. Frost influenced the character of many Public Health Service studies, while Dr. Collins improved the techniques for such studies and carried them to new heights of usefulness.

Dr. Collins' contributions to methodology are seen in two comprehensive health surveys of national scope and numerous smaller intensive community surveys. The survey by the Committee on the Costs of Medical Care in 1928-31 and the National Health Survey of 1935-36 were more ambitious than anything of their kind previously undertaken in this country. They were based on cross sections of the population, using methods of sampling that were advanced for their time. The community study in which the health and medical care of a

population is analyzed over a period of time was of particular interest to Dr. Collins, and he played an important part in the designing of such studies as those conducted in Cattaraugus County and Syracuse, N.Y., and the 5-year survey of the Eastern Health District of Baltimore.

It was in his methods of analyzing the complex mass of data obtained in these surveys that Dr. Collins' ability was most evident. The soundness of these methods is indicated by the large number of them that have been adopted for use in later surveys, including the U.S.

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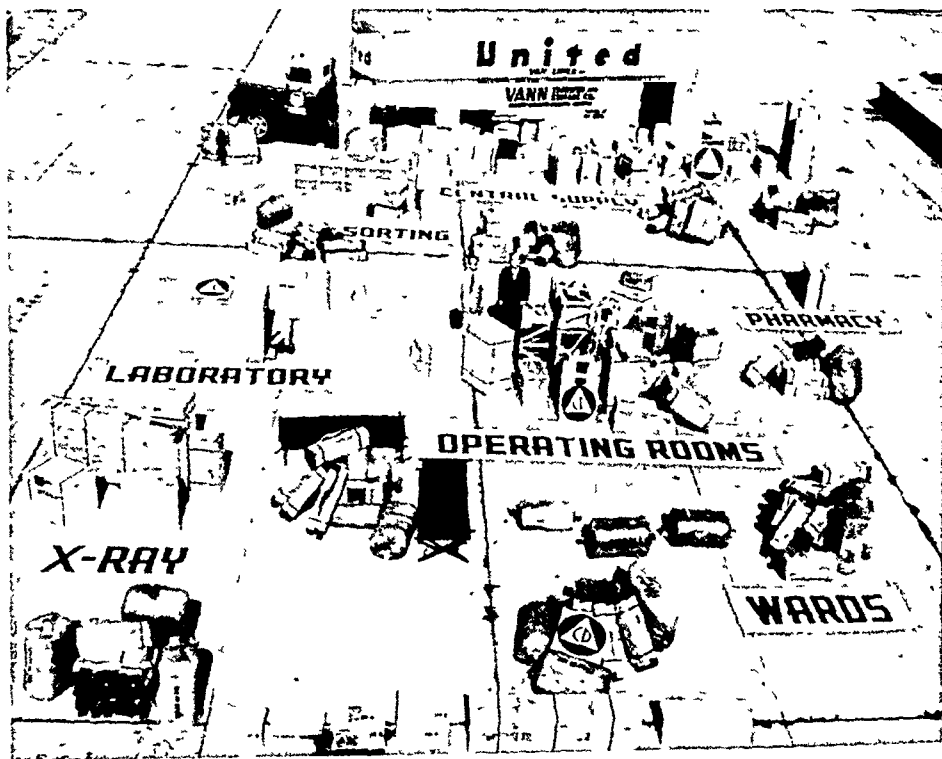
## Public Health Monograph No. 62

**Selwyn D. Collins' Contributions to Health Statistics: A Guide to His Works.** By Maryland Y. Pennell, Theodore D. Woolsey, Katharine S. Trantham, and Josephine L. Lehmann. Public Health Monograph No. 62 (PHS Pub. No. 737), 14 pages. U.S. Government Printing Office, Washington, D.C., 1960, 20 cents.

The accompanying text is the introduction to the grouping of Dr. Collins' publications into the 11 categories which form the principal contents of Public Health Monograph No. 62, published concurrently with this issue of *Public Health Reports*. This monograph is the joint work of four persons who served under Dr. Collins in the Division of Public Health Methods and are still in that division of the Public Health Service.

For readers wishing the data in full, copies are on sale by the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. Official agencies and others directly concerned may obtain single sample copies without charge from the Public Inquiries Branch, Office of Information, Public Health Service. Copies will be found also in the libraries of professional schools and the major universities and in selected public libraries.

# Civil Defense Emergency Hospital



Civil defense emergency hospitals, austere but functionally complete, are stored in strategic locations throughout the United States. Equipment is packed in 351 boxes which fit in a standard moving van.

In a demonstration of civil defense training techniques, 40 employees of the Metropolitan Life Insurance Co. set up a 50-bed emergency hospital in the auditorium of the firm's New York office. After only a preliminary briefing, the casualty aid unit unpacked 95 boxes and set up the hospital equipment in 1 hour and 15 minutes and repacked the items in 45 minutes.

The complete hospital consists of an admitting-triage area, shock ward, operating rooms, pharmacy, laboratory, central supply section with sterilization facilities powered by gasoline or bottled gas, generator, and X-ray machine with polaroid development process.

The demonstration, held March 8, 1960, with the assistance and guidance of the training branch staff, Division of Health Mobilization, Public Health Service, was a field test to orient personnel to the hospital prior to its use in the division's training courses.

The first course, "Medical Aspects of Health Mobilization," was offered April 18-23, 1960, at the eastern instructor center, Office of Civil Defense Mobilization, Brooklyn, N.Y. Its purpose was to bring up-to-date disaster information and training to a nucleus of professional personnel concerned with medical and health needs of the civilian population in an emergency. Students were 104 physicians, dentists, nurses, and veterinarians from government, private industry, and the Armed Forces.

Two similar courses were given May 8-13 at the OCDM Staff College, Battle Creek, Mich., and June 5-10 at the OCDM western instructors training center, Alameda, Calif., for civil defense directors and personnel in planning, operational training, and supervisory activities in health and medical services aspects of civil defense.

# Federal Publications

**Indians on Federal Reservations in the United States.** A digest. Albuquerque Area. *PHS Publication No. 615, pt. 4; 1960; 34 pages.*

Selected information is presented on Indian groups in Colorado and New Mexico and portions of Arizona and Utah. The population groups, their homes, education, and income sources, and their health status and services are discussed. Included also are brief descriptions of the location, ownership, and topography of reservation land.

**Health Statistics From the U.S. National Health Survey.**

**Chronic respiratory conditions reported in interviews, United States, July 1957–June 1958.** *PHS Publication No. 584-B12; 1959; 32 pages; 30 cents.*

For four diagnostic categories—asthma and hay fever, chronic bronchitis, chronic sinusitis, and other chronic respiratory conditions exclusive of tuberculosis—detailed tables give numbers and rates for the condition, medical attention status, and associated restricted activity and bed disability days.

Findings of previous surveys and estimates made by researchers in the health field are cited to provide a background for these first data on chronic respiratory conditions from the National Health Survey's household interview. To the extent that they are available, results of medical record and examination studies of these diseases are also presented; and they show how differing concepts of morbidity affect the magnitude of prevalence estimates.

**Heart conditions and high blood pressure reported in interviews, United States, July 1957–June 1958.** *PHS Publication No. 584-B13; 1960; 36 pages; 30 cents.*

Data on heart conditions and high blood pressure as reported in household interviews are presented in 14 detailed tables and 9 charts showing these chronic conditions by age, sex,

medical attention, and the associated days of restricted activity and bed disability.

The text includes a discussion of the differences in prevalence estimates obtained through different survey techniques.

**Dental care. Interval and frequency of visits, United States, July 1957–June 1959.** *PHS Publication No. 584-B14; 1960; 42 pages; 35 cents.*

This report amplifies previously published National Health Survey data on dental care.

It presents 14 detailed tables on the interval since last dental visit by age, according to sex, urban-rural residence, region of the country, race, family income, and education. A second group of 14 tables relates the same variables to frequency of dental visits.

**Dental care. Volume of visits, United States, July 1957–June 1959.** *PHS Publication No. 584-B15; 1960; 45 pages; 35 cents.*

Amplifying National Health Survey data presented earlier, this report contains nine tables showing volume of dental visits by urban-rural residence, region of the country, race, sex, and age, and by family income, education, and age.

In another 14 tables, the same variables are related to type of dental service—fillings, extractions, cleaning or examination, straightening, gum treatment, and denture work.

This report also carries population tables.

**Veterans. Health and medical care, United States, July 1957–June 1958.** *PHS Publication No. 584-C2; 1960; 52 pages; 40 cents.*

A major section is devoted to selected health characteristics of veterans and nonveterans and the extent to which these two groups use the services of physicians and hospitals. It includes 12 detailed tables and a number of charts.

This is followed by a section on

veterans classified in three war groups: the Korean conflict, World War II, and World War I combined with the Spanish-American War. Thirteen detailed tables are presented.

**A study of special purpose medical-history techniques.** *PHS Publication No. 584-D1; 1960; 27 pages; 30 cents.*

A methodological study preliminary to the development of a medical-history questionnaire and appropriate interviewing techniques for use in a health examination survey of adults is described under seven broad headings: the research problem, the developmental interviews, reliability of responses, comparison of interviews taken by nurses and nonmedical trained interviewers, effectiveness of the open interview, and effectiveness of the self-administered and the closed-interview procedures.

The research was conducted by the survey research center of the University of Michigan under contract with the U.S. National Health Survey. Charles F. Cannell, Ph.D., and Morris Axelrod, Ph.D., of the Institute for Social Research, directed the project and were responsible for the analysis and the report.

*Appendices in these publications give technical notes on methods, sampling errors, definitions of terms, and the questionnaire used in the household interviewing.*

**International Classification of Diseases Adapted for Indexing of Hospital Records and Operation Classification.** *PHS Publication No. 719; 1959; 264 pages; \$1.*

Based on experience in a number of hospitals, finer subdivisions have been made in the International Classification of Diseases to promote a more efficient classification system for indexing diagnostic information on hospital records. The system is designed to permit location of the maximum number of records with the review of the least number. Also included is a classification of operations for indexing surgical cases.

The adaptation is an outgrowth of a collaborative study conducted by

# Signs

and

# Symptoms

Extremely hot weather is associated with a higher death rate than very cold weather, according to data from 1949 through 1958. Paul H. Kutschenreuter, U.S. Weather Bureau meteorologist, reported these findings at a meeting of the District of Columbia section of the American Society of Heating, Ventilating, and Air Conditioning Engineers.

The increase in deaths during a frigid spell is relatively small compared with what happens during a heat wave, he said. Hot weather deaths are sometimes triple the normal number for the season. The elderly are the hardest hit; the death rates of persons aged from 1 year through 24 years seem unaffected by either heat waves or cold spells.

« »

Americans under 20 years of age will number 90 million, 40 percent of the population, by 1970. Those over 65 years of age then will number about 21 million, more than 10 percent.

« »

A "disaster city" is being opened in Pasadena, Calif., for use as an emergency civil defense or alternate local government headquarters. The main building contains a large auditorium, office space, classrooms, a modern kitchen, and nurses' quarters. An estimated 10,000 refugees could be housed in tents on the grounds and fed from the kitchen facilities.

A "disaster street" is under construction to be used as a training area for civil defense personnel and for testing rescue, monitoring, and first-aid conditions.

The installation will serve also as a full-time police academy and will be available to the public for selected civic projects.

Safety information for baby sitters is being encouraged through local campaigns by the Florida State Board of Health in cooperation with the National Safety Council. Local health officers and other interested persons are receiving a packet containing a planning guide which suggests community courses in safety for baby sitters, leaflets for parents, and the basic informational needs of sitters.

« »

The mortality rate of mothers in Minnesota is approaching what might be considered an irreducible minimum, according to Dr. J. L. McKelvey, head of the department of obstetrics and gynecology of the University of Minnesota Hospitals, reporting on the Minnesota Maternity Mortality Study conducted since 1941 by a special subcommittee of the Minnesota State Medical Association. Minnesota's 1957 rate for obstetric deaths was 0.24 per 1,000 births, only slightly higher than the 0.2 per 1,000 usually considered to be the rational lower limit of maternal deaths.

« »

The U.S. Air Force is pursuing a medical survey of personnel exposed to microwaves to determine possible harmful effects. There has been evidence that microwaves form cataracts.

For some time, the suspected harmful effects were ascribed exclusively to "overheating" of tissues. But new data from several research centers strongly hint at more subtle and as yet little-understood non-thermal effects.

When influenced by microwaves, protozoa that normally move in a seemingly helter-skelter fashion suddenly march in orderly procession, Dr. John H. Heller of the New Eng-

land Institute of Medical Research reports. He emphasizes that effects on living cells are tied directly to the electromagnetic field, with very little leeway. Amebas, he states, which merely shift their line of march with changing exposures in the range of a few microseconds, may be "literally ripped to shreds" by fields lasting half again as long.

« »

The role of public health workers in accident prevention has been set forth by the Mississippi State Board of Health in an 11-page mimeographed pamphlet available upon request.

Full integration of accident prevention techniques into every existing health program of a local department is advocated. And emphasis is given to the need for encouraging community support and participation.

State and local health officers, public health nurses, sanitation personnel, health educators, nutritionists, communicable disease investigators, and clerks are given tips on ways to underscore good safety practices in the community while performing their duties.

« »

A joint liaison committee of epidemiologists and laboratory directors has been named by the Conference of State Epidemiologists and the Association of State Public Health Laboratory Directors. Dr. Elmer L. Shaffer of New Jersey has been appointed as chairman for 1960. The chairmanship will alternate each year between a laboratory director and an epidemiologist.

« »

Beginning in 1961, an estimated 200,000 Pennsylvania drivers who were licensed prior to 1924 will be required to submit a certificate from a physician and a State police examiner testifying that they meet minimum physical standards. And beginning in 1962, all drivers will be required to supply proof of a satisfactory physical re-examination every 10 years up to the age of 60, and every 5 years thereafter.

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The adaptation is an outgrowth of a collaborative study conducted by



the American Hospital Association and co-sponsored by the American Association of Medical Record Librarians. This is related to a study of efficiency in hospital indexing using the International Statistical Classification and the Standard Nomenclature of Diseases.

Although it is suitable for preparing statistical tabulations from hospital records, the adaptation does not serve as a medical nomenclature. (No free sample copies are available on this publication.)

**National Institute of Mental Health.** *PHS Publication No. 20; revised 1960; 30 pages; 15 cents.*

The organization and function of the National Institute of Mental Health, focal point for the Federal Government's efforts in the field of mental health and mental illness, are described. This booklet covers the institute's research, training, community services, and other activities in considerable detail.

It contains sections on research investigations conducted by the National Institute of Mental Health, research grants, training grants, State and local mental health programs, mental health project grants, program development, and public education. A four-page section of references is provided.

**Mongolism. Hope through research.** *PHS Publication No. 720 (Health Information Series No. 94); 1960; folder; 5 cents, \$3 per 100.*

Research by French and British scientists on the cause and prevention of mongolism and the program at the Public Health Service's National Institutes of Health are described in this folder.

According to the most recent theory reported in the pamphlet, mongolism may be triggered before pregnancy. In 1959 French investigators found in mongoloids studied, 47 chromosomes instead of the standard human 46. Chromosomes are the microscopic life threads within each cell which determine inherited characteristics, such as eye color and height.

To some researchers this new finding suggests that mongolism could

begin with an irregularity in the human egg before it is fertilized. They believe the discovery of the extra chromosome is a significant advance in the total search for the reason for mongolism.

The booklet mentions statistics showing that mongoloid children are born more frequently to older mothers than to younger women. About 1 mongoloid per 1,000 births is born to mothers under 30 years old. The rate rises with increasing age of mothers, to reach 2 to 3 per 100 births in women over 45 years old.

**Housing and Health.** *PHS Publication No. 718 (Public Health Bibliography Series No. 29); 1959; 27 pages; 15 cents.*

Intended for individuals working in and interested in the housing-health field, this publication is a compact, but comprehensive, collection of brief abstracts of 53 reports and studies made over the past 20 years.

It is designed to stimulate further interest in the housing-health field as well as strengthen the relationship of these fields. The information in the abstracts is sufficiently detailed for the reader to determine whether he wants to consult the original paper.

**Are You Related to a Diabetic?** *PHS Publication No. 726; 1960; 4 pages; 5 cents.*

This leaflet is designed for use by State and local health departments, voluntary organizations, and community groups in promoting case-finding activities among relatives of diabetic patients.

It briefly describes diabetes as a disease and the groups among the population most likely to be affected. The importance of early detection and treatment in preventing complications and reducing disability from diabetes is stressed.

**Accident Prevention. A handbook for public health nurses.** *PHS Publication No. 670; 1959; 55 pages; 25 cents.*

Accidents as a public health problem are described in relation to the philosophy of safety, their epi-

demiology, and the human factors involved. Special attention is given to accidental poisonings and poison control centers, burns due to fires, carbon monoxide poisoning, lead poisoning in children, motor vehicle safety, childhood accidents, and those of the aging.

The role of the public health nurse in homes, schools, conferences and clinics, and civic groups is discussed, and 14 specific actions which will enhance her work in accident prevention are given.

Tables and charts of accidental deaths and injuries are presented by age groups and types of accidents. The booklet also contains a list of national agencies active in accident prevention and listings of films, books, pamphlets, and articles related to accident prevention.

**National Water Quality Network.** Statistical summary of selected data, October 1, 1957-September 30, 1958. *PHS Publication No. 663, supplement 1; 1959; 164 pages; \$1.*

A Federal, State, and local cooperative report on water quality determinations at selected locations throughout the United States, this supplement to the complete compilation of the data deals with selected segments of the information on radioactivity, organic chemicals, and plankton in surface waters.

While no interpretations are made, it is hoped that this publication will stimulate, among those concerned with water quality, the application of these data to current and future problems in water quality management.

**An Industrial Waste Guide to the Cane Sugar Industry.** *PHS Publication No. 691; 1959; 19 pages; 25 cents.*

The sixth of a series of industrial waste guides, this booklet summarizes available information on the nature, types, and amounts of wastes produced by the cane sugar industry. It also reviews methods that have been developed and used to overcome or minimize the harmful effects of waste effluents.

This guide was prepared in cooperation with the National Tech-

nical Task Committee on Industrial Wastes. It is intended primarily to assist the operators and managers of sugarcane processing plants to use, reduce, and otherwise suitably dispose of their waste waters. It is also designed to inform personnel of regulatory agencies of the sources and pollutional characteristics of sugarcane wastes and the status of developments in waste treatment.

**Septic Tank Care.** *PHS Publication No. 73 (Health Information Series No. 96); revised 1960; folder; 5 cents, \$2.50 per 100.* Written in nontechnical language for the individual homeowner. Discusses proper care and maintenance of septic tank sewage disposal systems and describes their functions and factors affecting them. Gives advice on how to avoid trouble and expense by inspecting the septic tank at regular intervals and determining when cleaning is needed. Encourages householder to provide himself with a diagram of his septic tank system. Back of pamphlet designed so that diagram and record of inspections can be kept there.

**Enterobacteriaceae. Biochemical methods for group differentiation.** *PHS Publication No. 734; 1960; by W. H. Ewing; 30 pages; 20 cents.*

This handbook was designed to be a practical guide for use by any laboratory, whether large or small, that does enteric bacteriological work. In it the author brings together, probably for the first time under a single cover, all of the tests found valuable in the classification of enteric bacteria.

Details to guide performance of each of the tests include materials and equipment required, procedures to follow, and interpretation of test results.

**Selected Articles on Nursing Homes.** *PHS Publication No. 732; 1960; 282 pages; \$1.50.*

Reprints of 47 articles and speeches deal with current problems facing nursing homes. The articles cover such subjects as nursing and related medical services, food services,

administrative management, and standards relating to the improvement of patient care in nursing homes. An appendix contains a directory of licensure agencies responsible for licensing nursing homes in the several States and list of selected special references.

This anthology was prepared to answer a growing need for reference material dealing with nursing homes.

**Protect Your Family Through Immunization.** *PHS Publication No. 697; 1959; folder; 5 cents, \$2 per 100.*

An immunization schedule for DPT (diphtheria, pertussis, and tetanus), poliomyelitis, smallpox, and boosters for all these, including individual tetanus boosters, is contained in this leaflet. The schedule is divided into three sections: first year of life, one year to entering school, and after age six.

Developed as a joint project of the American Academy of General Practice and the Public Health Service, this folder is intended to be given to patients by private physicians or health departments to provide a permanent immunization record for all members of the family.

**Tuberculosis Chart Series, 1960 Edition.** *PHS Publication No. 639; 1960; 28 pages; 25 cents.*

Nine charts and accompanying tables deal with the size and characteristics of the tuberculosis problem in the United States.

The introductory section discusses some of the highlights of the data. This edition focuses attention on the geographic variation of tuberculosis, mostly by States but with special attention to large cities.

**Index Medicus (formerly Current List of Medical Literature).** *Vol. I, No. 1; January 1960; 274 pages; single copies \$2.25, \$20 per year (\$25 foreign).*

A monthly index to the world periodical literature of medicine, the new *Index Medicus* supersedes both the *Current List of Medical Literature* of the National Library of

Medicine and the *Quarterly Cumulative Index Medicus* which was published by the American Medical Association.

The initial issue contains a list of 71 subheadings, an abbreviation listing of the indexed journals, subject and author sections, and a list of recent United States publications. Information on the loan policy, instructions to borrowers, and a statement on outstanding coupons for photographic services are inside the front cover.

Free sample copies are not available. All communications regarding subscriptions should be addressed to the Superintendent of Documents.

**What Consumers Should Know About Food Additives.** *FDA Leaflet No. 10; 1959; 12 pages; 15 cents.*

This booklet answers the many questions the public is asking the Food and Drug Administration about the Food Additives Amendment to the Federal Food, Drug, and Cosmetic Act. It tells the story of how food additives came to be developed, why and how they are used in food production, why public health safeguards are necessary, and how the new law works. It also gives factual information about the functions of many of the more important classes of food additives, and explains how the law controls two special classes of additives, pesticides and coal-tar colors.

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This section carries announcements of new publications prepared by the Public Health Service and of selected publications prepared with Federal support.

Unless otherwise indicated, publications for which prices are quoted are for sale by the Superintendent of Documents, U.S. Government Printing Office, Washington 25, D.C. Orders should be accompanied by cash, check, or money order and should fully identify the publication. Public Health price quotations, as well as single sample copies of those for which prices are shown, can be obtained without charge from the Public Inquiries Branch, Office of Information, Public Health Service, Washington 25, D.C.

The Public Health Service does not supply publications other than its own.

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## Local Health Departments GROWTH or ILLUSION?

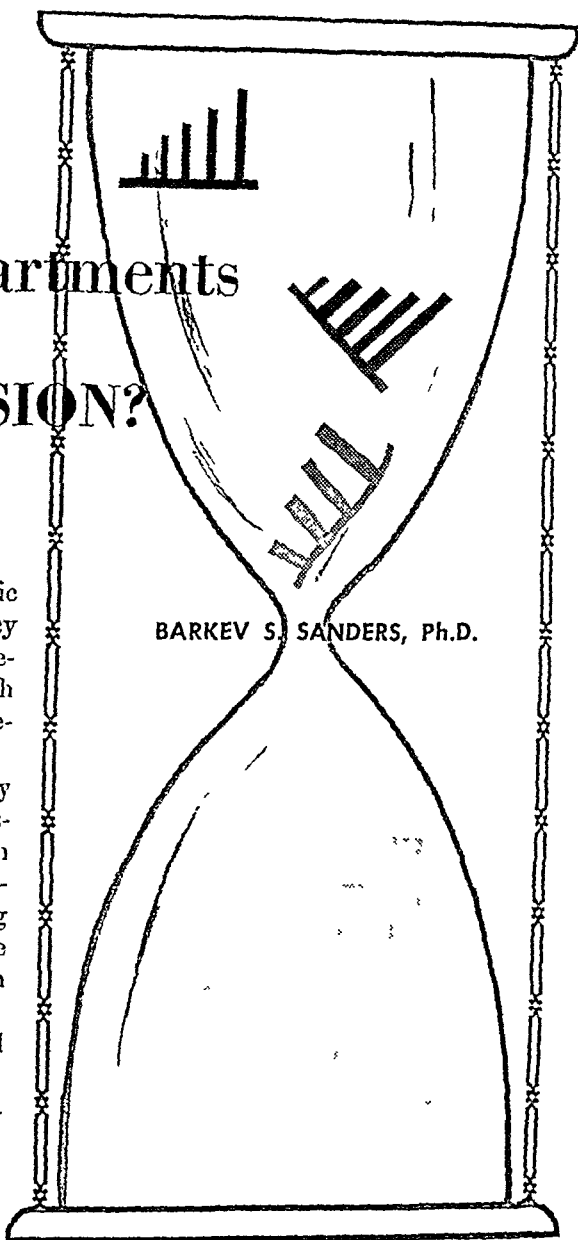
**S**TUDENTS of public health as well as civic leaders have begun to scrutinize the efficacy of the traditional pattern of local health departments (1-3). A critical look at the growth of these departments in recent years is therefore timely.

The growth of local health departments may be measured in several ways, each way possibly leading to a different conclusion. When independent approaches lead to common conclusions, however, we are justified in having greater confidence in the findings. We have chosen three methods of measuring the growth of local health departments in recent years:

- Extent of geographic areas covered by local health departments.
- Annual expenditures of local health departments.
- Number and skills of full-time local public health personnel.

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Dr. Barkev Sanders concluded there had been no growth in local health departments between 1950 and 1957, after an analysis of geographic expansion, annual expenditures, and number of full-time health department employees. He raised the questions of whether other agencies were supplying certain needed health services, whether American communities were less interested in health than formerly, or whether the health needs that local health departments can deal with effectively had diminished.



# How To Cut the Highway Toll in Half in the Next Ten Years

IRWIN D. J. BROSS, Ph.D.

*Dr. Bross, chief of the department of statistics, Roswell Park Memorial Institute, Buffalo, N.Y., presents his paper on highway accidents in question and answer form with the express purpose of improving communication with the general reader and of giving a broad picture of the current highway accident situation unobscured by too much detail.*

**Q.** Do you really think that the highway accident toll can be cut in half in the next 10 years?

**A.** I believe that it is technically feasible to do so. But let me make one point clear—I will be talking about the toll of deaths and serious injuries sustained by the occupants of cars in highway accidents. This toll can be drastically cut even if there is no reduction in the total number of accidents, or even in the total number of injuries. In other words, the highway accidents would still occur, but the occupants would tend to suffer minor or moderate injuries rather than serious or fatal injuries.

**Q.** What do you mean by technically feasible?

**A.** Cutting the highway toll in half in 10 years is a realistic target for the large-scale, coordinated scientific attack on the automobile accident problem that I will outline here. The strategy, tactics (techniques), and data for this attack are all developed, tested, and ready to go. The target could be achieved without any remarkable new scientific or technological advances: without revolutionary changes in our cars, highways, or traffic control systems; and without "reforming" the behavior patterns of drivers. In short, I am not serving up a slice

of "pie-in-the-sky." At the same time, the scientific program is not a "pianola."

**Q.** What does that mean?

**A.** The scientific program won't "play itself"—it will require the wholehearted cooperation of the groups with a big stake in the auto accident problem—the automobile manufacturers, legislators, law enforcement agencies, safety groups, scientists, and, of course, the general public. Getting this cooperation is something more than a technical problem. I think that if the public realized how close we are to a major reduction in the highway toll, the cooperation would be forthcoming. Each year of delay in putting our new knowledge to use costs us thousands of unnecessary deaths and serious injuries on our highways.

**Q.** Why is this cooperation so essential?

**A.** The simplest way for me to answer this question is to outline the broad strategy of a scientific attack on the accident problem. There are seven steps in going from the scientific investigation of actual highway accidents to the eventual reduction in the death rates. I will list the steps and then go back to discuss each one:

*Step 1.* Collect a massive series of detailed, scientific reports on the accident circumstances and resulting injuries of persons involved in highway accidents.

*Step 2.* Formulate a clear conceptual picture of the chain of events that leads to the trauma in the accidents.

*Step 3.* Test the theory of step 2 against the facts of step 1. If the theory fails to fit the facts, go back and try again.

*Step 4.* Once the event-chain is established, consider ways in which the undesirable event-chain can be broken or modified by preventive measures. Estimate the potential savings in lives or reduced degree of injury so as to establish the relative importance of preventive measures.

*Step 5.* Translate the preventive measures into specific design changes, commonly called "hardware." This step usually entails moving from the field (that is, highway investigations) into the laboratory (the engineering studies). The hardware would be tested in the laboratory under simulated field conditions.

*Step 6.* Incorporate the specific design changes into the production line—put the hardware on American cars.

*Step 7.* Evaluate the effectiveness of the design changes. This entails moving out of the laboratory and back into the field. In other words, we must determine how well the hardware works in actual highway accidents. If the hardware doesn't do its job, then it's back to the drawing boards. The acid test is the actual reduction in deaths and serious injuries on the highway.

**Q.** Is this a new strategy you have presented?

**A.** Yes and no. In principle this is the same strategic approach which has been so successful in the past in eradicating the infectious diseases or bringing them under control. In other words, these steps can be regarded as an application of the epidemiological approach to the problem of automobile accidents. In practice, this is a new approach. In fact it is only within the last few years that the first step was taken, and only in the past few months that the process has gone all the way through to step 7. But going back to your previous question: Close cooperation between the various groups with an interest in the accident problem is needed in all of the steps and particularly in step 6. Until this step is taken, scientific knowledge cannot actually save lives on the highway.

**Q.** So it is up to the automobile manufacturers to put the "hardware" on the cars?

**A.** Not just the manufacturers. They are in a highly competitive situation where minor price or styling changes might make a big dif-

ference in sales. Legislation and public support are needed to protect the manufacturer who is willing to give safety priority over styling and sales appeal.

### The "Horse Shoe Nail" Story

**Q.** Let's get down to brass tacks. Can you give an actual example of how this strategy was used?

**A.** I'd be glad to. Let me tell you a story that might be called "The Horse Shoe Nail." For want of a nail a kingdom was lost—for want of a quarter inch of steel, some 15,000 lives have been lost in the past 5 years. The story starts with the first step in the strategy, the development of the factfinding system of the Cornell Automotive Crash Injury Research Program (ACIR). The basic ACIR sample consists of tens of thousands of case histories of occupants in injury-producing rural highway accidents. An occupant comes into the sample if (a) the accident occurs in a designated sample unit, (b) it is investigated by State troopers, and (c) someone in the car is injured. The trooper fills out a detailed report of the accident circumstances, such as the speed, accident configuration, seated position of the occupants, and so on. He also takes photographs of the car. The attending physician fills out a medical report on the nature and degree of the injury. The ACIR staff receives these field reports and processes them. The processing consists of collating the reports on a given person, checking the reports for errors or omissions, analyzing these reports, and putting the information on punchcards.

The ACIR factfinding system has provided information which is adequate, both in quality and quantity, for a genuine scientific study of the accident injury problem. The success of its program is due to the fine cooperation of the law enforcement agencies and medical societies in a dozen different States and also, of course, to the individual doctors, troopers, and others who take part in this program.

**Q.** Why do you place so much stress on the factfinding system?

**A.** For one thing, it plays a key role in all subsequent steps; for another, the lack of progress toward a solution of the crash injury prob-

lem in the past generation—the failure to make any appreciable dent in the death rates—is due, to a considerable extent, to a lack of cold, hard facts. You cannot base an effective safety program on slogans, scapegoats, and suppositions. In the days of the plagues, it was believed that disease was a punishment for sins and heresy. But exhorting sinners or burning heretics didn't stop the plagues. Nowadays the highway plague is blamed on the sins of the driver. But exhorting people to drive carefully or cracking down on "crazy mixed up kids" hasn't cut down the death rates. We need an approach that starts with solid facts.

**Q.** But isn't the driver responsible for deaths and injuries?

**A.** The driver may be responsible for the accident—for setting the stage—but once the accident starts, driver behavior has little influence on the event-chain that leads to the injuries. After the accident starts, psychology leaves off, and physics and biology take over.

**Q.** You have referred several times to event-chains. Could you give an example?

**A.** Gladly. First let me set the stage. Let us suppose that we are watching a car that is traveling 50 miles an hour down a ditched, high-crown rural highway. For some reason—an oncoming vehicle, a crate in the road, a misjudgment—the driver veers on to the narrow shoulder and the car starts to roll. Our event-chain starts the instant before the occupant, say the driver, begins to move relative to car structure—say his seat.

**Q.** Does this type of accident happen very often?

**A.** Rollover is a common rural highway accident. About one-fifth of the occupants in the ACIR sample are in rollovers. Now, when the car begins to roll, two things happen simultaneously. In a typical event-chain the occupant starts moving toward the door due to the centrifugal forces. At the same time, the frame of the car is deformed or twisted. This deformation of the frame disengages the door lock and the door pops open. Next the driver is thrown through the open door: he is ejected. He then follows a trajectory through the air. Up to this point in the event-chain, it is quite possible that the driver has not sustained any injury.

**Q.** In other words, the injury will depend on what he hits and how he hits it?

**A.** Yes. If he lands head first on concrete he is likely to sustain a fatal skull fracture. If he happens to land just right on a patch of grass, he may not be hurt at all. This brings up a useful conceptual device: the probability event-chain. In a given case history, there is a single chain of events, but when we consider a series of individuals we find a branching process. In other words, if we have a set of occupants with the same event-chains up to a given point, we find that beyond this point the chains branch off and lead to different degrees and types of injuries. By means of design changes we may be able to prevent some of the event-chains that terminate in death or serious injuries.

**Q.** How so?

**A.** Well, let's go back to the point in the rollover event-chain where the frame twists and the door lock disengages. If the door lock does not disengage, the door stays closed, the occupant stays inside of the car, and we get a very different event-chain. An extra quarter of an inch of steel in a bolt-action door lock would probably hold the door closed. In this way a design change can modify the chain of events in any automobile accident. When we change the event-chain, we also change the injury picture for better or for worse.

**Q.** Then the question is: Will the occupant be better off inside than outside of the car?

**A.** Yes, and if we define "better off" a bit more precisely we can now proceed to formulate a scientific hypothesis (step 2) and test it (step 3). For example, if by "better off" we mean a lower risk of death, our hypothesis might be: The risk of death is higher for an ejectee than for a nonejectee in a rollover accident. When we compare the observed risk of death for ejectee and nonejectee in the ACIR data, we find that for occupants ejected through doors in a rollover accident the risk of death is 0.141, or about 1 chance in 10. For nonejectee occupants the risk of death is 0.008, or about 1 chance in 100. The ejectees have roughly 17 times as large a chance of sustaining a fatal injury! Of course, we have only considered deaths and not the full injury scale.

**Q.** What happens if the full injury scale is considered?

**A.** One way to deal with the full scale is to use a technique called *ridit* analysis and to frame the hypothesis in a somewhat different form. Here we would want to estimate the chance that an ejectee will sustain a higher degree of injury than a nonejectee in corresponding accident circumstances, in this case rollover accidents. From the ACIR data we would estimate that the chances are about three to one that the ejectee will sustain a higher degree of injury. Either way it is plain that odds are heavily against the ejectee.

**Q.** Did you have a special reason for using rollover accidents as an example?

**A.** Yes, I did. In rollovers, a single factor, ejection, dominates the picture and this simplifies matters. At the same time, rollover accidents are the heart of the ejection problem; about half of the fatally injured ejectees in the ACIR sample were in rollover accidents.

**Q.** But what about other types of accidents? Might we not want the doors to come open in these accidents?

**A.** We can proceed for other accident configurations along the same lines as for rollover.

The results for death rates and *ridit* analysis are given in table 1. You will note that the odds are consistently against the ejectee. However, the advantage enjoyed by the nonejectee tends to be less than the advantage in rollover accidents. Also, in some accident configurations, such as head-on collisions, ejection plays a minor role.

**Q.** Isn't it possible that the seeming advantage of nonejectees merely reflects the fact that ejection tends to occur at higher speeds—where the risks are higher anyway?

**A.** Table 2 shows what happens when the data are tabulated by the applicable impact speed. You will note that within each of the four speed categories, the odds are against the ejectee. In the same table, you can also see the results of a tabulation by seated position of the occupants.

**Q.** What would happen if you were to consider all three factors—configuration, speed, and seated position—at the same time instead of one at a time as in your tables?

**A.** This leads to  $4 \times 5 \times 9 = 180$  different accident circumstances and in this fine cross tabulation we often are left with relatively few cases in a given cross category. Subject to

**Table 1. Risks of ejected and nonejected occupants in nine accident configurations**

Accident configuration	Deaths only			Full injury scale (ridits)	
	Estimated risk of death		Relative risk of ejectees	Estimated probability that ejectee is worse off	Approximate odds that ejectee is worse off
	Ejectees	Nonejectees			
Nonrollover: 2 cars					
I. Head-on collision-----	0. 333	0. 107	( <sup>1</sup> )	0. 745	( <sup>1</sup> )
II. Broadside (impact on passenger compartment)-----	. 086	. 033	3	. 726	2:1
III. Overtake: trailing car-----	. 000	. 010	( <sup>1</sup> )	. 697	( <sup>1</sup> )
IV. Overtake: leading car-----	. 039	. 002	20	. 652	2:1
V. All others (fender-fender, etc.)-----	. 120	. 020	6	. 699	2:1
Nonrollover: 1 car					
VI. Collision with immovable object-----	. 100	. 037	3	. 642	2:1
VII. Collision with movable or partly movable object-----	. 076	. 008	9	. 708	2:1
Rollover					
VIII. Principal-----	. 141	. 008	17	. 759	3:1
IX. Secondary (with impact)-----	. 106	. 022	5	. 666	2:1

<sup>1</sup> Less than 10 ejectees (too few for reliable estimates).

**Table 2. Risks of ejected and nonejected occupants at four applicable impact speeds and in five seated positions**

Impact speed of car and seated position of occupants	Deaths only			Full injury scale (ridits)	
	Estimated risk of death		Relative risk of ejectees	Estimated probability that ejectee is worse off	Approximate odds that ejectee is worse off
	Ejectees	Nonejectees			
Applicable impact speed (m.p.h.)					
0-19	0. 018	0. 004	5	0. 708	2:1
20-39	. 035	. 007	5	. 678	2:1
40-59	. 099	. 026	4	. 673	2:1
60+	. 211	. 096	2	. 669	2:1
Seated position					
Driver alone	. 156	. 043	4	. 631	2:1
Driver with passenger	. 113	. 019	6	. 747	3:1
Center front	. 061	. 014	4	. 643	2:1
Right front	. 110	. 032	3	. 662	2:1
Rear	. 113	. 010	11	. 740	3:1

this qualification, I can say that we did not find a significant advantage to the ejectee in any of the 180 circumstances.

**Q.** Would you say, then, that it is always better to stay inside the car?

**A.** No, there are doubtless some circumstances where it would be better to be ejected. However, these circumstances are quite rare. To sum up, then, we have a massive weight of evidence in favor of keeping the occupant inside of the car. Since most ejection takes place through car doors and since the door lock mechanism determines whether or not the doors stay closed, we are led to specific design change—a better door lock. We are now in step 4 of the scientific process. Let me postpone the last part of step 4—estimation of the lifesaving potential of the door locks—so as to get on with the rest of the process.

**Q.** But I thought that the new cars were equipped with improved door locks.

**A.** After the ACIR report on ejection, the automobile manufacturers undertook step 5 of the process. I shall not go into detail on step 5 since this phase is primarily an engineering operation. Suffice it to say that the engineers developed a modified version of the original door lock and that this modification performed well under the simulated accident conditions of the testing labs. Modified door locks have been installed on nearly all American cars manufactured after 1955—thus step 6 was taken. There

remained only an on-the-highway evaluation of the modified door locks—step 7.

**Q.** But you've said that the locks were tested in the laboratory. Why was it necessary to test them on the highway?

**A.** Quite a few devices and techniques that work nicely in the laboratory fail under actual field conditions. In fact, this is what happened with the modified door locks. They were better than their predecessors, but their performance was disappointing in rollover accidents, which, as we've seen, are the heart of the ejection problem. There was only about a 25 percent improvement in the holding of door locks in rollover accidents.

**Q.** Why wasn't this weakness discovered in the laboratory tests?

**A.** I can't give a definite answer on this. However, there are two likely explanations. First, rollover force conditions are not easily simulated in a laboratory. Second, the hard-top styling trend—which came in about the same time as the modified door locks—weakened the top support and hence permitted greater deformation of the frame in a rollover. This tended to cancel out the improvement in the lock. Incidentally, this example points up the need for better cooperation between laboratory and field scientists.

**Q.** So after going through all seven steps, not much was accomplished after all.

**A.** Not this time—but I don't think that we



have reached the end of this "Horse Shoe Nail" story. After all, if we can package two monkeys to survive a free fall from outer space, we ought to be able to package the occupants of a car to survive the force conditions in a rollover accident. An extra quarter of an inch of steel in a bolt-action door lock could give a happy ending to the story.

**Q.** Isn't that something of an alibi?

**A.** I don't think so. I do not deny that the modified door locks failed to hold the doors closed, especially in rollover accidents. However, the lifesaving potential of a positive-acting door lock is still there. We have simply failed to exploit it. But the seven-step process is self-correcting—we may not hit our target on the first shot, but we learn from our mistakes. Next time our aim should be much better.

#### **Lifesaving Potential of Door Locks**

**Q.** You keep talking about the lifesaving potential of door locks, but can you really show that there is such a potential?

**A.** To make a careful estimate of the potential savings in lives from prevention of ejection requires a fairly extensive statistical analysis such as the one given by Boris Tourin (1).

**Q.** Can you show me how lives could be saved—without going into a lot of confusing statistical technicalities?

**A.** Well, I can show you—roughly, at least—how a good proportion of the deaths in the ACIR sample of rural injury-producing accidents might have been prevented by a positive door lock. I can do this directly from the raw data given in table 3. To avoid too many numbers, I have consolidated the data into 12 accident circumstances, and table 3 shows the number of fatalities and the number of occupants in each of the circumstances.

**Q.** What are the circumstances?

**A.** I have combined the accident configurations into three categories (good, fair, poor) for reasons which will become clear in the course of the discussion. I have considered just two applicable impact speeds (under 60 miles per hour, 60 miles per hour and over). For simplicity, I have given only two ejection categories—not ejected and completely ejected through doors. I have omitted complicated

kinds of ejection (partial ejection, ejection not through doors). Hence there are  $3 \times 2 \times 2 = 12$  circumstances shown in table 3.

**Q.** What am I supposed to look for in table 3.

**A.** Let's start with the cell in the upper left-hand corner, the nonejectees in low-speed accidents in the "good" accident configurations. What do you notice about the risk of death for these occupants?

**Q.** It's pretty small—less than 1 in 100. What does this mean?

**A.** To see what this means, take a look at the next cell in the row—the person in low-speed accidents in "good" configurations who were ejected. There are 521 of the ejectees and 42 of them were killed. Now let us suppose that all cars had positive door locks and that these 521 persons would have stayed inside of the car. Under this assumption, these 521 persons would have had the event-chains characteristic of nonejectees instead of the event-chains characteristic of ejected occupants. Now if these people had stayed inside the car, how many of them would have been killed?

**Q.** When a person is actually thrown out of the car, how can you possibly know what would have happened to him if he had stayed inside?

**A.** We can't know what would have happened to a particular individual. However, we can make some estimate of what would have happened in the series of 521 occupants. From the upper left-hand cell we can directly estimate the risk of death for occupants who stay inside of the car (0.006). If we suppose this same risk applies to the 521 persons who were hypothetically held inside by a positive door lock, then we can find the "expected" number of deaths in the series by simple multiplication— $521 \times 0.006 = 3.2$ . In other words, under the above assumptions we would have expected only about 3 deaths in this series of 521 occupants.

**Q.** But there were really 42 people killed. What does the three "expected" deaths mean?

**A.** Well, by this line of reasoning, 39 of the 42 deaths could have been prevented by positive door locks. In other words, the great majority of these deaths were unnecessary. Now let's apply the same reasoning to the high-speed accidents in the "good" category. What do you notice in table 3?

**Q.** The risk of death goes up a bit for non-ejectees, but it is still only a little more than 1 in 100. So by your argument most of the 73 deaths in the upper right-hand cell could also have been avoided. That's your point, isn't it?

**A.** Yes. We would expect only about 5 deaths in the 361 ejectees, and so positive door locks might have saved about 68 lives. Hence in the "good" accident configurations we might have avoided  $39 + 68 = 107$  of the 137 deaths. Of course, the situation is much less favorable in other accident configurations.

**Q.** What happens in the "fair" configurations?

**A.** A positive door lock might have saved about 31 of the 137 deaths—roughly one-fifth of the toll, with most of the savings coming from the lower speed ejectees. Hence the positive door lock is just a start—though a good start—toward cutting the death toll in "fair" configurations.

**Q.** What about the "poor" configurations?

**A.** You'll notice that ejectees account for only 32 of the 177 fatalities. Moreover, the differential in the risks between ejectee and nonejectee has become smaller, though ejectees still have the higher risks. Thus door locks could be expected to save only about 11 lives in the "poor" configurations. When we total up the savings in lives over all the configurations, it turns out to be about 150, or one-third of the 451 deaths in table 3. However, we couldn't hope to cut the national death rates

by this much because no door lock could hold 100 percent of the time, because the door lock would probably be less effective in urban accidents, and for some other reasons. Nevertheless, we would be getting a big saving in lives for a rather small price—an extra quarter of an inch of steel in the door lock. I might note here that a majority of the occupants in table 3 were in cars equipped with the modified door locks.

### Other Strings in the Bow

**Q.** Positive door locks alone couldn't cut the highway toll in half, could they?

**A.** No, door locks are no panacea. They are just one of a series of design changes that would be needed to do the job. I have emphasized door locks because they provide a clear-cut example of the scientific process.

**Q.** What other design changes are needed?

**A.** Quite a list of preventive measures has come out of the ACIR studies and other investigations. I won't have time to go into this list. There are a number of design changes that are effective only in certain specific accident circumstances. There are other design changes that would be important in a wide range of accident situations. The seven-step process would apply to any of these safety features.

**Q.** What about seat belts?

**A.** I won't say much about seat belts here because they will be the subject of another ACIR paper. In brief, it is found from Cali-

**Table 3. Number of occupants and fatalities in 12 accident circumstances**

Accident configuration	Class of occupants	Applicable impact speed				Total
		Under 60 m.p.h.		60 m.p.h. and over		
		Not ejected	Ejected	Not ejected	Ejected	
Good (IV, VII, VIII) .....	{Fatalities .....	15	42	7	73	137
	{All occupants .....	2,478	521	497	361	3,857
Fair (III, V, IX) .....	{Fatalities .....	52	31	42	12	137
	{All occupants .....	4,294	319	319	59	4,991
Poor (I, II, VI) .....	{Fatalities .....	88	15	57	17	177
	{All occupants .....	2,975	294	305	63	3,637
	Total fatalities .....	155	88	106	102	451
	Total occupants .....	9,747	1,134	1,121	483	12,485

fornia data that a seat belt is of value in keeping the occupants inside the car. However, the study failed to demonstrate that the seat belts were of value in preventing contact with an interior structure. Hence the seat belt seems to be a useful interim measure to control ejection, but it has the drawback that its effectiveness depends upon the willingness of the occupants to use the belts. In the California study about two-thirds of the occupants in cars equipped with seat belts were not wearing them at the time of the accidents.

**Q.** Can you give some examples of the design modifications that apply to specific accident circumstances?

**A.** Each accident circumstance has its own particular problems and hence tends to highlight particular components of the car. For instance, in a rollover, it is important to prevent the top structure from caving in during the roll. During the past few years the top supports appear to have been dangerously weakened by the trend to "hardtop" styling. To reverse this trend, safety has to be given priority over style. Another good example of the special problems of an accident configuration occurs when one vehicle rams into the rear of another one—the overtake accident. By Newton's third law, the forces on the two vehicles are equal and opposite. However, it turns out that the risks in the trailing car are considerably higher than those in the leading car.

**Q.** Why is this?

**A.** One possible explanation is that the rear impact on the leading car throws the occupants back into their seats. In effect, then, the leading car has the "rearward facing seats" that have been often advocated as a protective measure. A second, and more important, factor emerges when "car-car" accidents are separated from "car-other vehicle" accidents ("other vehicles" are mostly trucks). It would appear that much of the trauma in the trailing cars occurs when they run into heavy, high-bed trucks. This in turn suggests that the rear structure of trucks be redesigned—particularly to prevent a low-hooded car from running under the bed of the truck. Although the injury picture is favorable in the leading car, it could still be improved. Here the indicated de-

sign changes would focus on seat backs—particularly for the right front seat occupant. Perhaps these brief remarks will give some idea of how protective measures can be developed for specific accident situations.

**Q.** What are some of the design changes that are important over a wide range of accident circumstances?

**A.** One design change is suggested by table 3. You will notice that a substantial proportion of the deaths among nonejectees occur in accidents where the applicable impact speed is 60 m.p.h. or more. Because there is usually some braking action prior to impact, the impact speed tends to be somewhat more than 10 m.p.h. lower than the traveling speed. This means that one of the cars in the high-impact speed accidents was likely to have been traveling at more than 70 m.p.h. However, it is not a difficult technological problem to prevent cars from traveling more than 70 m.p.h.

**Q.** Hasn't speed restriction often been tried?

**A.** Past efforts at speed control have emphasized education or law enforcement, but the direct method of control by engineering has been shunned. I would suggest that it be mandatory for all new cars to be equipped with a sealed governor set at 70 m.p.h. To get such hardware on all U.S. cars would require close cooperation between manufacturers, legislators, and law enforcement agencies—and public support—but it isn't an impossible task. A 70 m.p.h. limit would not interfere with the efficiency of the automobile as a means of transportation—only a tiny minority of motorists actually do much sustained driving at speeds in excess of 70 m.p.h. Nor is this any more of an infringement on personal liberty than our present laws against suicide. You can see from table 3 that the lifesaving potential is considerable—especially in the "fair" configurations.

**Q.** Are there other examples of design changes with a broad scope?

**A.** Delethalization is another major line of development.

**Q.** What is delethalization?

**A.** Broadly speaking, it means getting rid of pointed objects, projections, sharp bends in instrument panels, and other hazards in the car

interior. An effective delethalization program requires a careful study of the relationship between specific components—steering wheels, for instance—and specific kinds of injuries—such as chest injuries. Apparently minor matters—such as the number of spokes in the wheel—are likely to be the key to effective delethalization. Each individual modification may seem unimportant, but collectively they can produce a worthwhile reduction in the highway toll.

**Q.** In all of the examples that you've mentioned, the design changes have been made in the vehicles. Are there other kinds of design changes that are promising?

**A.** Yes, highway design and traffic control devices also provide promising preventive measures. For example, the "poor" configurations are head-on collisions, broadside accidents (impact on the passenger compartment), and one-car collisions with immovable objects. These configurations are fairly rare on limited-access divided highways of modern design. On the older highways, improved traffic control devices could reduce the frequency of these "poor" configurations. Future research will probably reveal still other ways to influence the event-chains in automobile accidents—but even if we merely exploited our present leads, we could cut the highway toll in half.

### Summing Up

**Q.** What, then, are your overall conclusions about the auto accident problem?

**A.** To sum up:

There is a practical, scientific approach to the highway accident problem. The strategy, tactics, and basic data for this approach have already been developed and tested.

Scientific investigation of the accident event-chains has suggested a series of preventive measures which have a high potential for the reduction of deaths and serious injuries.

These preventive measures need to be translated into design changes, or "hardware"; the hardware has to be installed on American cars and tested on the road. This is the present bottleneck.

The wholehearted cooperation of groups with a stake in the auto accident problem is needed to break the bottleneck. Vigorous public support of this scientific program could insure the necessary cooperation.

Assuming reasonable cooperation, it would be realistic to set the following target for 1970: A 50 percent reduction in the deaths and serious injuries sustained by occupants of cars in highway accidents.

### REFERENCE

- (1) Tourin, B.: Ejection and automobile fatalities. Pub. Health Rep. 73: 381-391, May 1958.

**NOTE:** This paper was prepared with the help of Mrs. Barbara McNulty and Mrs. Charlotte Zweifach, who carried out the numerical analyses for this paper, and of the Automotive Crash Injury Research staff, who provided the information in machine runs for this material.

### Occupational Health Course for Local Officers

A training course in occupational health for local health officers was held in Jacksonville, Fla., May 5 and 6, 1960. Co-sponsored by the Occupational Health Branch, Public Health Service, and the division of radiological and occupational health, Florida State Board of Health, the course was designed to intensify the awareness, on the part of local health officers, of the significance of occupational health questions and of the ways in which basic health department staffs can contribute to this field of health.

In addition to local health officers, public health nurses and sanitarians were attracted to the course, bringing the total number of participants to 94.

# Note on Cigarette Smoking and Lung Cancer

Since the publication of my article, "Tobacco Consumption and Mortality from Cancer and Other Diseases" (*Public Health Reports* 74: 581-593, July 1959), I have received several requests for age-specific mortality rates for lung cancer, particularly among cigarette smokers.

The following table presents age-specific mortality rates computed from the same data as the mortality ratios given in the previous publication. The rates are shown only for ages 55 years and over since the number of deaths for the younger age groups during the period included was not large enough to warrant the computation of age-specific rates.

Among men who were currently smoking cigarettes and who had never used tobacco in any other form, the death rate from lung cancer for each age group consistently increased with an increase in the average daily consumption of cigarettes. The increase in the death

rate for heavy smokers—more than a pack a day—relative to that of light smokers—less than one-half pack per day—was highest for the youngest age group, 55-59 years, and decreased with advancing age. The death rate for heavy smokers was 3.9 times that for light smokers at ages 55-59 years; for the age groups 60-64 years and 65 years and over the corresponding ratios were 2.9 and 1.5.

All groups of men currently smoking only cigarettes experienced a definitely greater risk of dying from cancer of the lung than did non-smokers. The death rate from lung cancer for men who were smoking more than a pack of cigarettes per day was 14 times greater than the rate for nonsmokers at ages 55-59 years, 19 times greater at ages 60-64 years, and 11 times greater at ages 65 years or more.—HAROLD F. DORN, chief, Biometrics Research Branch, National Heart Institute, National Institutes of Health, Public Health Service.

Number of deaths and death rate per 100,000 per year from lung cancer by age, smoking history, and current amount smoked, U.S. Government life insurance policy holders, July 1954-December 1956<sup>1</sup>

Smoking history and current amount smoked	Rate per 100,000				Number of deaths		
	55 and over	55-59	60-64	65 and over	55-59	60-64	65 and over
Never smoked <sup>2</sup> .....	16.6	12.2	14.1	31.6	5	6	6
Cigarettes—total: <sup>3</sup>							
All amounts.....	158.8	112.9	175.3	261.7	72	91	52
—10 per day.....	110.9	47.3	100.2	261.1	4	9	11
10-20 per day.....	137.1	91.2	151.9	230.1	27	41	24
21 or more per day.....	210.0	159.6	249.2	325.4	41	44	17
Cigarette only: <sup>3</sup>							
All amounts.....	179.2	134.1	201.1	275.7	55	67	32
—10 per day.....	104.5	48.2	92.5	242.8	2	4	5
10-20 per day.....	162.4	115.3	181.2	254.2	22	31	16
21 or more per day.....	224.9	174.5	269.4	338.0	31	32	11
Cigarette and other: <sup>3</sup>							
All amounts.....	124.7	74.7	132.9	242.1	17	27	20
—10 per day.....	116.9	46.4	107.4	278.6	2	5	6
10-20 per day.....	93.8	47.6	101.2	193.4	5	10	8
21 or more per day.....	178.6	126.1	207.7	304.6	10	12	6

<sup>1</sup> The number of deaths includes all deaths with a diagnosis of lung cancer, whether considered as a primary, contributory, or non-contributory cause of death. <sup>2</sup> Includes occasional smokers of any form of tobacco, past or present. <sup>3</sup> Includes only persons currently smoking cigarettes.

# Controlled Trial of BCG Vaccination in a School Population

GEORGE W. COMSTOCK, M.D., Dr.P.H., and LAWRENCE W. SHAW, M.A.

THE ROLE of BCG vaccination in tuberculosis control programs has been cloaked with controversy almost since the day in 1921 when BCG was first administered to a human subject (1). Although some aspects of the problem have been clarified by controlled field trials of vaccination, divergent conclusions have been reached regarding its usefulness. This is well illustrated by two of the most recently reported trials, one involving a quarter of a million participants in Puerto Rico and the southeastern United States, and the other, 56,700 subjects in Great Britain (2,3). Both reports agreed that the risk of developing tuberculosis was considerable among reactors to a low dose of tuberculin. But for nonreactors, the British found a high risk of developing disease and substantial protection from vaccination, while the American trials led to the opposite conclusions, namely, that the risk for nonreactors was low and that the benefits conferred by vaccination were too slight to counterbalance its disadvantages. Nevertheless, midst the welter of conflicting findings and opinions, there appears to be growing acceptance of the view that BCG vaccination should not be used in populations whose risk of becoming infected with *Mycobacterium tuberculosis* is slight (4-7).

The validity of this view is illustrated by the results of a controlled trial of BCG vaccination among the school population of Mus-

cogee County, Ga., begun in April 1947. Observations during the ensuing 12 years show that the infection rate in the community has been low and diminishing, that reactors to a low dose of tuberculin ran the greatest risk of developing tuberculous disease, and that BCG vaccination had no demonstrable effect on the tuberculosis problem.

## Procedures

The tuberculin testing and BCG vaccination procedures have been described (8). Briefly, all participants were tested with 5 T.U. of PPD, and the nonreactors to this dose were tested with 100 T.U. of PPD. The PPD was supplied by the State Serum Institute of Copenhagen, Denmark, and was designated as lot RT 18. Throughout this report, reactors are defined as persons with 5 millimeters or more of induration to the specified dose of PPD. To allay concern on the part of parents and teachers, reactors to the 5-T.U. dose were advised to have a chest X-ray. No further followup examinations were advised for reactors with negative chest X-rays because it was then generally believed that their risk of developing tuberculosis was slight.

Because a negative reaction to the 100-T.U. dose was considered to be a necessary prerequisite for vaccination in 1947, all nonreactors to the 5-T.U. test were given the larger dose. For those who reacted to the 100-T.U. test, nothing more was advised. Nonreactors were divided into two groups on the basis of their birth year. One group was vaccinated and the other was left unvaccinated as a con-

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*Dr. Comstock is chief, Epidemiological Studies, and Mr. Shaw is chief, Records and Statistical Services, Tuberculosis Branch, Public Health Service. This paper is sixth in a series.*

trol. The vaccine, supplied by Dr. S. R. Rosenthal of the Research Foundation, Chicago, Ill., was administered by multiple tangential acupuncture on the third or fourth day after preparation.

Six months later, 70 percent of the vaccinated students were retested with 5 T.U. and 100 T.U. of PPD. At that time 45 percent were reactors to the 5-T.U. dose, and 93 percent reacted to the 5- or 100-T.U. doses. The nonreactors to the 100-T.U. dose were revaccinated.

Cases among the study population were identified through the normal casefinding and reporting facilities in the county. The mechanics of case identification were simplified by combining tuberculosis control and research activities in the metropolitan area into a single facility, the Muscogee County Tuberculosis Study (9). Because of the extensive casefinding conducted in this area and the highly cooperative attitude of the local physicians, it is very unlikely that important cases of tuberculosis have been missed among the resident population even though no effort was made to examine each participant periodically. The records of persons classified as tuberculosis cases or suspects were matched with a master index file which contained the tuberculin and vaccination status of participants in the 1947 trial. The 1947 tuberculin and vaccination status was not recorded on the clinic case records.

### The Study Population

Approximately 16,000 children were enrolled in the schools of Muscogee County in 1947. The study population is restricted to 11,262 children whose 5-T.U. tests were read at 48 hours. These children came from all grades of the city, county, and parochial school systems. All but 1.5 percent were between the ages of 5 and 19 years, the average age being 11.4 years. The subdivision of this population into study categories is shown in table 1. Of the total, 1,492, or 13 percent, had positive reactions to 5 T.U. of PPD. Another 3,768, one-third of the study population, were classified as reactors to the 100-T.U. dose. The 5,261 nonreactors to both doses were to be divided into two roughly equal groups, one to be vaccinated and the other to be left unvaccinated as controls. However, 422 were classified as "irregulars" since they did not qualify for the vaccinated or control groups for such reasons as refusal to accept vaccination if offered or medical contraindications to vaccination.

There was a marked difference between the two races with respect to tuberculin sensitivity to the 5-T.U. test. Only 8 percent of the white children were classified as reactors to 5 T.U. compared with 26 percent of the Negro children. The distribution of the 5-T.U. reaction sizes is shown for each race in the chart. Three-fifths of the Negro reactors but only two-fifths of the white reactors had 10 mm. or more of indura-

**Table 1. Composition of study population, by tuberculin and vaccination status and race, Muscogee County, Ga.**

Tuberculin and vaccination status	Both races		White		Negro	
	Number	Percent	Number	Percent	Number	Percent
<i>5-T.U. tests</i>						
Completed tests.....	11, 262	100. 0	7, 767	100. 0	3, 495	100. 0
Reactors.....	1, 492	13. 2	590	7. 6	902	25. 8
Nonreactors.....	9, 770	86. 8	7, 177	92. 4	2, 593	74. 2
<i>100-T.U. tests</i>						
Completed tests.....	9, 029	80. 2	6, 675	85. 9	2, 354	67. 4
Reactors.....	3, 768	33. 5	2, 606	33. 6	1, 162	33. 2
Nonreactors.....	5, 261	46. 7	4, 069	52. 4	1, 192	34. 1
Controls.....	2, 341	20. 8	1, 818	23. 4	523	15. 0
Vaccinees.....	2, 498	22. 2	1, 948	25. 1	550	15. 7
Irregulars.....	422	3. 7	303	3. 9	119	3. 4

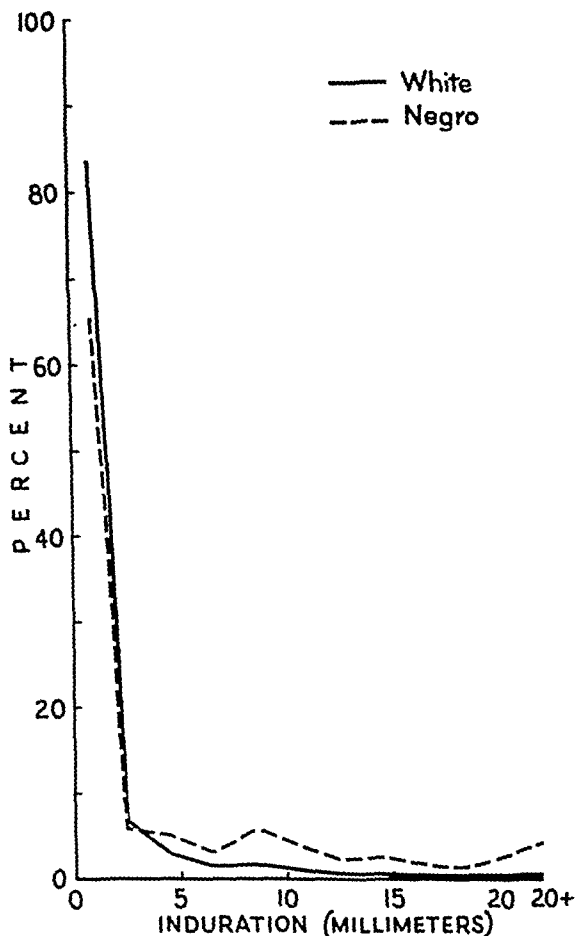
tion. A surprising finding at the time was that the proportion of the study population reacting only to the 100-T.U. dose was similar for whites and Negroes. In addition, while the frequency of reactions to the 5-T.U. test, particularly those of 10 mm. or more, were in line with other indices of the tuberculosis problem in the two races, those to 100 T.U. were not. The failure of the 100-T.U. reactions to reflect the extent of the tuberculosis problem in the various subgroups of the community was one of the early clues to the existence and high prevalence of nonspecific tuberculin sensitivity in the southeastern United States (10). Because of the use of the 100-T.U. dose, only one-half of the white children and one-third of the Negro children were eligible for vaccination.

### Estimating the Infection Rate

One reason for selecting Muscogee County, Ga., as the site for a field study of tuberculosis and BCG vaccination was the belief that the tuberculosis problem in this area is not too different from that of the United States as a whole. However, weak sensitivity to tuberculin, especially that elicited only by the 100-T.U. dose, was prevalent to an unusual degree. Subsequent studies have shown that most of this weak sensitivity can be attributed to sources other than *M. tuberculosis* (11-13). This has an important bearing on the use of conversion rates as an index of the risk of acquiring specific tuberculous infection. In this area, it now appears that most of the reactions to 5 T.U. of PPD with induration less than 10 mm., and some of the larger reactions as well, are caused by an agent other than *M. tuberculosis* (14). Consequently, in this paper, a conversion will be defined as a reaction to the 5-T.U. dose which changes from less than 5 mm. to more than 10 mm. of induration. It is believed that the conversion rate, so defined, will approximate the tuberculosis infection rate reasonably well.

The infection rate in the school population in this area can be estimated from the results of two tuberculin surveys in the school system subsequent to the 1947 BCG trial. The first was the 1950 BCG trial, in which 5 T.U. of PPD (RT 19-20-21) was used (2). The second survey in 1957 covered all junior and

Percentage distribution of the study population by initial reaction to 5 T.U. of PPD, by race, Muscogee County, Ga.



senior high schools in Muscogee County and in Russell County, Ala. (the county adjoining Muscogee County to the west and part of the same metropolitan area). The tuberculin used in the second survey was also 5 T.U. of PPD (RT 19-20-21). At the time of testing and reading, the observers did not know the tuberculin and vaccination status of the children in the 1947 or 1950 trials.

In the spring of 1950, 1,379 controls from the 1947 trial were tested. All of these 1,379 subjects had less than 5 mm. of induration to both 5- and 100-T.U. tests in 1947. Three years later, 0.9 percent of the whites and 4.9 percent of the Negroes had reactions larger than 10 mm. to the 5-T.U. dose (8). This is equivalent to an average annual infection rate of about 0.3 percent for whites and 1.7 percent for Negroes.



Too few controls from the 1947 program were tested in 1957 to yield reliable results. However, 611 students who were controls in the 1950 trial were retested in April 1957. At that time, 1.3 percent of the white controls and 4.7 percent of the Negro controls had converted from less than 5 to more than 10 mm. of induration to 5 T.U. of PPD. This is equivalent to an average annual infection rate of 0.2 percent for whites and 0.7 percent for Negroes.

These infection rates have been calculated as an average over a period of years. They were lower in the second period than in the first. Therefore, it is not unreasonable to assume that they have been decreasing over the entire 10-year period, and that the rate for 1957 was about 0.1 percent per year for whites and 0.3 percent for Negroes. The rate for whites is essentially the same as that estimated for white naval recruits from all sections of the United States (15). It appears likely that the risk of becoming infected with *M. tuberculosis* in

Muscogee County is not too different from the average risk in the country as a whole, and that the risk in Muscogee County, again like most other parts of the Nation, is not only low but has been diminishing.

### Comparison of Controls and Vaccinees

The similarity of the vaccinated and control groups with respect to certain characteristics is shown in table 2. Controls and vaccinees were almost identical in their race, sex, and age composition. Their initial sensitivity to both doses of tuberculin was likewise almost the same. The similarity of their participation in the 1950 trial suggests that both groups remained in the community and participated in subsequent community programs to almost the same extent. Consequently, there is no reason to believe that the procedure for allocating some persons eligible for vaccination to the control group and others to the vaccinated group was not successful in producing two essentially similar subgroups of the study population.

**Table 2. Comparison of controls and vaccinees, Muscogee County, Ga.**

Characteristic	Controls	Vaccinees
Number.....	2,341	2,498
Race (percent):		
White.....	77.7	78.0
Negro.....	22.3	22.0
Sex (percent):		
Male.....	48.1	45.6
Female.....	51.9	54.4
Mean age (years).....	9.7	9.6
Initial reaction to 5 T.U. of PPD (percent):		
No reaction.....	83.3	84.1
Erythema only.....	12.0	11.7
1-4 mm. induration.....	4.7	4.1
Initial reaction to 100 T.U. of PPD (percent):		
No reaction.....	49.0	48.2
Erythema only.....	34.7	36.9
1-4 mm. induration.....	16.3	14.8
Participation in 1950 BCG program (percent).....	58.9	57.9

### Cases of Tuberculosis

In the 12-year period, April 1, 1947, through March 31, 1959, 44 members of the study population were classified as tuberculosis cases or suspects. As can be seen in table 3, most of them were among the reactors to 5 T.U. of PPD. Of the total group of 44 cases, one was known to the Muscogee County tuberculosis study prior to the 1947 trial; 4 others were later classified as nontuberculous. These five persons have been excluded from the study group of cases. Also excluded are four persons classified as suspected cases of tuberculosis. The only evidence shown by three of them was an indeterminate shadow on the chest X-ray which was not characteristic of tuberculosis. The fourth suspect, who was a reactor to the 5-T.U. dose in 1947, had disease of a submental lymph node, from which acidfast bacilli were demonstrated by smear on one occasion. Cultures were negative, and the clinical course was not characteristic of tuberculosis.

Restricting the cases to the 35 persons whose tuberculosis was classified as definite and who

Table 3. Final classification of participants classified at some time during the study as tuberculosis cases or suspects, by 1947 tuberculin and vaccination status, Muscogee County, Ga.

Classification	Total	Reactors, 5 T.U.	Nonreactors, 5 T.U.			
			Not tested, 100 T.U.	Reactors, 100 T.U.	Nonreactors, 100 T.U.	
					Controls	Vaccinees
Participants ever classified as tuberculosis cases or suspects.....	44	28	3	7	2	4
Cases known prior to 1947 program.....	1	1	0	0	0	0
Later discharged as nontuberculous.....	4	2	1	1	0	0
Suspected cases.....	4	1	0	1	0	2
Definite cases.....	35	24	2	5	2	2

<sup>1</sup> Also diagnosed prior to 1947 program.

were first diagnosed after the program started removes four cases from the 5-T.U. reactors, two from the 100-T.U. reactors, none from the controls, and two from the vaccinees. The net effect of these exclusions is to decrease the relative magnitude of the tuberculosis problem among reactors as compared with nonreactors, and also among vaccinees as compared with controls.

The type and stage of disease of the study group of cases is shown in table 4, according to the organ and degree of most serious involvement. Of the 35 definite cases, 28 were solely or predominantly pulmonary tubercu-

losis, and 7 nonpulmonary; 20 of these definite cases had one or more bacteriological examinations reported as positive for acidfast bacilli. There were no significant differences between the subgroups of the study population with respect to the proportion of cases bacteriologically confirmed.

Most of the definite cases had serious disease. Twenty of them had had either advanced pulmonary disease or serious forms of nonpulmonary tuberculosis. In addition, 20 of the 35 had positive bacteriological examinations, 15 by smear and culture of sputum specimens, 4 only by culture of sputum, and 1 only by cul-

Table 4. Classification of cases, by tuberculin and vaccination status, Muscogee County, Ga.

Tuberculosis classification	Total	Reactors, 5 T.U.	Nonreactors, 5 T.U.			
			Not tested, 100 T.U.	Reactors, 100 T.U.	Nonreactors, 100 T.U.	
					Controls	Vaccinees
Total.....	35 (20)	24 (13)	2 (1)	5 (3)	2 (2)	2 (1)
Pulmonary.....	28 (20)	20 (13)	1 (1)	4 (3)	2 (2)	1 (1)
Far advanced.....	9 (9)	5 (5)	1 (1)	2 (2)	1 (1)	
Moderately advanced.....	9 (8)	6 (5)		1 (1)	1 (1)	1 (1)
Minimal.....	6 (3)	5 (3)		1		
Primary.....	4	4				
Nonpulmonary.....	7	4				
Meningeal.....	1	1	1	1	0	1
Bone and joint.....	1	1				
Lymph node.....	1	1				
Pleurisy with effusion.....	4	1	1	1		1

<sup>1</sup> 1 death from tuberculosis in each of these two groups.

NOTE: Numbers in parentheses indicate those with bacteriological examinations positive for acidfast bacilli.

**Table 5. Treatment advised for definite cases, by tuberculin and vaccination status, Muscogee County, Ga.**

Treatment advised	Total	Reactors, 5 T.U.	Nonreactors, 5 T.U.			
			Not tested, 100 T.U.	Reactors, 100 T.U.	Nonreactors, 100 T.U.	
					Controls	Vaccinees
Total.....	35	24	2	5	2	2
Hospitalization.....	21	14	1	3	2	1
Home treatment.....	2	1	0	0	0	1
None.....	12	9	1	2	0	0

ture of gastric washings. The severity of disease is also reflected in table 5, which shows that 21 cases were advised to be treated in a tuberculosis hospital. All but one (a control) accepted this advice. Most cases occurred at a time when there were enough hospital beds for sick and infectious patients, but not enough to hospitalize cases of doubtful clinical significance.

On the whole, the outcome for these cases was quite favorable, as shown in table 6. Almost all were entirely well and leading normal lives on October 1, 1959. Two were still under treatment and 2 had died, both prior to the availability of isoniazid. One fatal case occurred in a Negro girl with far advanced pulmonary tuberculosis diagnosed in January 1951, who died in December 1951. The other was in a white girl whose primary lesion was detected a few weeks after the program started. She developed tuberculous meningitis and died in March 1948. There were no significant differences between reactors and nonreactors with

respect to the treatment advised or the outcome of disease.

The year in which the definite cases were first recognized is shown in table 7. Among 5-T.U. reactors, 80 percent were diagnosed in the first 5 years following the initiation of the trial, compared with only 1 of 11 cases occurring among nonreactors to the 5-T.U. dose. Among nonreactors to the 100-T.U. dose, all four cases came to recognition in the last 6 years of the observation period.

Among the 5-T.U. reactors, five cases were diagnosed in the first month after the trial started, all as a result of chest X-rays advised for reactors to the first tuberculin test. All but one of the remaining cases among 5-T.U. reactors and all but one of the nonreactors to 5 T.U. had one or more negative chest X-ray examinations prior to the date of diagnosis. Consequently, 28 of the 35 cases represent recognizable disease known to have developed after the initiation of the trial. Rates based on these 28 cases give a minimum measure of incidence,

**Table 6. Health and treatment status on October 1, 1959, of definite cases, by tuberculin and vaccination status, Muscogee County, Ga.**

Health and treatment status	Total	Reactors, 5 T.U.	Nonreactors, 5 T.U.			
			Not tested, 100 T.U.	Reactors, 100 T.U.	Nonreactors, 100 T.U.	
					Controls	Vaccinees
Total.....	35	24	2	5	2	2
Dead from tuberculosis.....	2	2	0	0	0	0
Disabled, under treatment.....	1	0	0	1	0	0
Well, under treatment.....	1	1	0	0	0	0
Well, no treatment.....	31	21	2	4	2	2

**Table 7. Year in which definite cases of tuberculosis were first recognized by tuberculin and vaccination status, Muscogee County, Ga.**

Year of recognition	Total	Reactors, 5 T.U.	Nonreactors, 5 T.U.			
			Not tested, 100 T.U.	Reactors, 100 T.U.	Nonreactors, 100 T.U.	
					Controls	Vaccinees
Total.....	35	24	2	5	2	2
1st.....	5	1 <sup>5</sup>				
2d.....	2	2				
3d.....	4	4				
4th.....	4	2 <sup>4</sup>				
5th.....	5	4		2 <sup>1</sup>		
6th.....	1		1			
7th.....	3	1			2	
8th.....	5	2	1	2		1
9th.....	2			1		
10th.....	2	1				1
11th.....	2	1		1		
12th.....	0					

<sup>1</sup> All diagnosed in April 1947.

<sup>2</sup> One case who did not have a negative chest X-ray at least once prior to diagnosis.

or the "development" of new cases of disease. Rates based on the total group of 35 cases reflect newly "reported" tuberculosis.

#### Newly Reported Cases of Tuberculosis

The average annual rate of newly reported cases among the total study population was 26 per 100,000, as shown in table 8. The rate for 5-T.U. reactors was tremendously higher than for nonreactors, 134 for reactors and only 9 for nonreactors. No significant differences were noted among nonreactors to 5 T.U. according to

their sensitivity to the 100-T.U. dose. The rates among controls and vaccinees were the lowest observed and were essentially the same.

The degree of sensitivity in 1947 to 5 T.U. of PPD appeared to be closely related to the tuberculosis case rate. This is shown in table 9. Persons with no induration to the 5-T.U. test had the lowest rates, whereas persons with 10 mm. or more of induration had extremely high rates. The case rate among Negroes was appreciably higher than among whites at all levels of initial sensitivity to tuberculin, the difference being most marked among students

**Table 8. Cases of definite tuberculosis among participants and average annual rates per 100,000 population, by tuberculin and vaccination status, Muscogee County, Ga.**

Item	Total	Reactors, 5 T.U.	Nonreactors, 5 T.U.			
			Not tested, 100 T.U.	Reactors, 100 T.U.	Nonreactors, 100 T.U.	
					Controls	Vaccinees
Participants.....	11, 262	1, 492	741	3, 768	2, 341	2, 498
Definite cases.....	35	24	2	5	2	2
Average annual rates per 100,000.....	25. 9	134. 0	22. 5	11. 1	7. 1	6. 7

Note: 422 nonreactors to 100 T.U. classified as "irregulars" had no cases of tuberculosis and, although included in the total, are not shown separately in the table.

**Table 9. Tuberculosis case rates among participants, by race and size of reaction to 5 T.U. of PPD, Muscogee County, Ga.**

Induration to 5 T.U. (mm.)	Both races			White			Negro		
	Popula- tion	Cases		Popula- tion	Cases		Popula- tion	Cases	
		Number	Rate <sup>1</sup>		Number	Rate <sup>1</sup>		Number	Rate <sup>1</sup>
Total.....	11, 262	35 (7)	25. 9	7, 767	5 (2)	5. 4	3, 495	30 (5)	71. 5
0.....	7, 090	7 (1)	8. 2	5, 265	1	1. 6	1, 825	6 (1)	27. 4
1-4.....	2, 680	4	12. 4	1, 912	0		768	4	43. 4
5-9.....	698	5	59. 7	337	1	24. 7	361	4	92. 2
10 and greater.....	794	19 (6)	199. 0	253	3 (2)	98. 8	541	16 (4)	246. 4

<sup>1</sup> Average annual rate per 100,000.

NOTE: Numbers in parentheses are persons without negative X-rays prior to diagnosis.

with little or no induration to the initial test. For possible application to tuberculosis control programs, it is worth noting that children with 5-T.U. reactions of 10 mm. or more comprised only 7 percent of the total study population, but yielded 54 percent of the total cases over the 12-year period. During the first 5 years of observation, the same 7 percent yielded 80 percent of the cases.

Even though there were very few cases among nonreactors to the 5-T.U. dose, their known characteristics were examined to see if any hint of a high-risk subgroup could be detected. Aside from the fact that 10 of the 11 cases were in Negroes, this effort was not successful. There was no suggestion that the tuberculosis case rate was related to initial age,

sex, place of residence, or socioeconomic status as judged by housing characteristics in 1946.

#### Known Incidence of Tuberculosis

As noted previously, 28 of the cases among the study population had had at least one negative chest X-ray examination prior to the date of diagnosis of tuberculosis. These cases, whose disease is known to have developed after the start of the trial, may be used to measure the incidence of tuberculosis among the study population.

It is also possible to estimate the proportion of the study population remaining in the community during the 12-year observation period. In 1954, a 2 percent sample of the 1946 census

**Table 10. Incidence of new cases of definite tuberculosis per 100,000 person-years experience at stated ages, by reaction to 5 T.U. of PPD, Muscogee County, Ga.**

Age group (in years)	Reactors			Nonreactors		
	Person-years experience	New cases		Person-years experience	New cases	
		Number	Rate <sup>1</sup>		Number	Rate <sup>1</sup>
Total.....	13, 400	18	134	89, 000	10	11
5-8.....	400	0		7, 500	0	
9-12.....	2, 000	2	100	20, 700	0	
13-16.....	4, 200	5	120	28, 400	2	7
17-20.....	4, 100	8	197	21, 600	4	19
21-24.....	2, 300	3	130	9, 200	4	44
25-28.....	500	0		1, 800	0	

<sup>1</sup> Cases per 100,000 person-years.

population was drawn for a survey of blood pressure levels in Muscogee County (16). From that sample, the proportion of the population remaining in the metropolitan area 8 years later was calculated. Over the initial age span of 5 to 18 years, which includes almost all of the present population, it was found that older children had left the community to a somewhat greater extent than younger children, and whites somewhat more than Negroes.

Applying the race-age specific rates of emigration to the study population allows an estimate of the number of children remaining in the community at the end of each year of the observation period. From such a tabulation, it is then possible to estimate the number of person-years of experience contributed by members of the study population for each year of age.

If the newly developed cases are allocated to the year of age at which they were first diagnosed, an estimate of the incidence rate for successive age groups can be developed. This is shown in table 10 for reactors and non-reactors to 5 T.U. of PPD during the age span 5 to 28 years of age.

The incidence rate for reactors to the 5-T.U. dose is 134 per 100,000 person-years of observation, slightly more than 12 times that for nonreactors. For both reactors and nonreactors, higher rates are observed in the older age groups. This finding is consistent with observations of other workers that the years of late adolescence and early adult life comprise one of the periods of greatest risk from tuberculous disease (17-19).

## Discussion

The findings of this study support the conclusions of subsequent controlled trials of BCG vaccination in Puerto Rico, Georgia, and Alabama (2). The most striking finding of those trials, and of the present trial as well, was that persons who were reactors to 5 T.U. of PPD had the greatest risk of developing tuberculosis. A corollary to this finding is that nonreactors to the 5-T.U. dose had such a low risk of developing tuberculosis that there is serious question about the need for vaccination of nonreactors in this country. So low is this risk in the present study that after observing

nearly 10,000 children for a period of 12 years, only 10 cases of tuberculosis are known to have developed.

Although too few cases were observed among controls and vaccinees to attempt any assessment of the efficacy of vaccination among non-reactors, it is obvious that vaccination was not completely effective. Nor could failure be attributed to lack of trying. The vaccinees were retested 6 months after vaccination. At that time, 45 percent reacted to the 5-T.U. dose and 93 percent to the 100-T.U. dose. Those who had less than 5 mm. of induration to 100 T.U. were revaccinated. In the 1950 BCG trial, 42 percent of the vaccinees were again vaccinated, partly because of loss of allergy and partly because only the results of the 5-T.U. test were used in 1950 to select persons for vaccination. Although postvaccinal allergy in this trial was not nearly as marked as has been reported by others (20), the tuberculin sensitivity of the vaccinated group was increased appreciably by vaccination. It should also be kept in mind that there is far from universal agreement that ability of a vaccine to confer protection is necessarily dependent on its ability to produce strong allergy.

It is of some interest to note the postvaccinal allergy of the two cases which occurred among the vaccinees. Initially, neither of them had any reaction (erythema or induration) to 100 T.U. of PPD. Six months after vaccination, one subject still had no reaction to the 100-T.U. test. He was revaccinated and following this showed 15 mm. of induration to 100 T.U.; in 1950, he had 4 mm. of induration to the 5-T.U. test. The other subject had 12 mm. of induration to the 5-T.U. test 6 months following vaccination but was not tested in 1950.

Unfortunately, there were also too few cases among nonreactors to the 5-T.U. dose to cast much light on the attractive hypothesis that the agent responsible for low-grade tuberculin sensitivity in the southeastern United States also confers some resistance to tuberculosis, possibly by acting as a sort of natural vaccination (21). This may be so, but a higher attack rate than that observed among nonreactors in Muscogee County or a much larger study population would be necessary to test this hypothesis.

The conditions of the present trial are closer to the BCG trial conducted by the British Medical Research Council (3) than any controlled trials previously reported. Both populations were of school age, and although the British participants were initially 4 years older on the average than the Muscogee County children, the latter have been followed 5 years longer. The British students have been followed to an average age of 22 years, the Muscogee children to an average age of 23 years. In addition, like the British procedure, reactors to the 100-T.U. dose of PPD were excluded from both the control and vaccinee groups. Although chest X-rays were not routinely used in screening the Muscogee County participants, it is possible to classify all but two cases according to their initial X-ray status. Exclusion of the five cases diagnosed within a month of the initial tests and of the two cases without negative X-rays prior to diagnosis yields a group of cases reasonably similar to those developing among participants in the British trial.

Thus it is reasonable to compare the number of new cases observed during the first 8 years of the Muscogee County trial with the number expected had the rates among British participants for the first 7½ years applied to the Muscogee population. Although one could hardly expect exact agreement, one might anticipate that observed and expected numbers would be of the same order of magnitude if environmental conditions were reasonably similar. Conversely, if observed and expected numbers differed grossly, one might suspect that the characteristics of the two trial populations were dissimilar in some important respect.

Among reactors to the 5-T.U. dose in Muscogee County, 16 new cases are known to have developed in the first 8 years, where 12 would have been expected at the British incidence rates (with allowance for differences in tuberculosis risks for subjects with differing degrees of sensitivity to the 5-T.U. dose). This is quite close agreement, and suggests that the risk for British and Muscogee low-dose reactors is generally similar.

On the other hand, where 2 cases had been observed in the first 8 years among unvaccinated controls, 34 would have been expected had the British rates applied. This is quite a striking

difference and not likely to be explained by differences in age or race composition, case-finding procedures, or population losses. In fact, it is difficult to explain this difference in observed and expected cases on any basis except that the risk of infection for British school leavers must be very much higher than the risk in Muscogee County and in most parts of the United States.

Among the nonreactors to 5 T.U. who reacted to the 100-T.U. dose, 2 cases were observed; application of British rates indicates that 23 would have been expected. Although some of the 100-T.U. reactors in Muscogee County were vaccinated in 1950, the reduction in tuberculosis attributable to vaccination is too low in this population to account for much of the difference in observed and expected numbers. The simplest explanation is again that the infection rate from *M. tuberculosis* in British cities must have been much higher than in Muscogee County.

Among vaccinees, no cases were observed in the first 8 years. British experience suggests that six cases should have been expected.

It is of course possible that some of the differences between observed and expected numbers might arise from the application of British rates during late adolescence to Muscogee County children in a period of life when they would not be expected to have reached their age of greatest risk. However, table 7 shows that observation of cases for 4 more years, to the point where the age difference between the two study populations is no longer marked, does not increase the number of cases appreciably. Even comparing cases observed during 12 years with those expected during 8 years, had the British rates applied to this population, leaves considerable similarity for low-dose reactors (18 observed, 12 expected), and marked disparity for low-dose nonreactors with completed 100-T.U. tests (8 observed, 63 expected).

Comparison of the results of these two trials suggests that the risk of infection must have been many times higher in Great Britain than in the United States. This has a direct bearing on the need for vaccination in the two areas, since it seems obvious that the need for vaccination varies directly with the likelihood of becoming infected. No matter how effective a

vaccine may be, vaccination can have little impact on the tuberculosis problem when the risk of infection is as low as it is in most of this country today. Whether or not BCG can be expected to reduce morbidity rates among non-reactors in this country in areas where infection rates may still be high is a moot question. Certainly the low protection observed in the southeastern United States and in Puerto Rico gives little hope that BCG vaccination could be a useful tool elsewhere in this country (2).

One finding of this study relates to casefinding activities among school populations. The incidence of tuberculosis among the total study population was clearly too low to warrant any consideration of periodic chest X-ray examinations, and the infection rate has become too low to warrant annual tuberculin testing. However, the initial testing with 5 T.U. of PPD did delineate a high-risk group, namely, students with 10 mm. or more of induration. These students comprised only 7 percent of the population examined in 1947. Initially and in the ensuing 5 years, 80 percent of the cases were found among this small segment of the initial population. This finding strongly suggests that the currently popular tuberculin testing programs among school populations must be carefully done in all respects in order to define as sharply as possible the small group at greatest risk. Further, it appears that this small group should be kept under surveillance with annual chest X-rays for at least 5 years after a strongly positive tuberculin reaction has been discovered. Studies done elsewhere indicate that examination of all household associates of very young, strongly positive tuberculin reactors is a productive method of detecting cases of active tuberculosis and an important facet of tuberculin testing programs (22).

In areas where the infection rate is low, it seems that repeated tuberculin testing of entire school populations on an annual basis may well be inefficient since so few newly infected students could be discovered each year. In such areas, it would appear more reasonable to test the school population on entrance to school, and again during adolescence.

These recommendations would have sounded completely unrealistic in 1947. At that time, it seemed most important to find some way of

protecting the currently uninfected population from the presumed high risk of developing disease soon after infection had occurred. The healthy reactor then was viewed as having passed safely through the period of appreciable risk. Today, as a consequence of a number of studies on tuberculosis infection and incidence rates, it is recognized that tuberculosis among the currently uninfected population in the United States is not of critical importance, but rather that the already infected population is the important seedbed of future disease. As a result of this knowledge, it is now clear that in addition to efforts designed to identify infectious cases and to prevent them from creating new reactors, it is essential to discover some effective means of preventing the development of disease among apparently healthy reactors, thereby sterilizing the present seedbed of disease before another crop of tuberculosis cases can be germinated.

### Summary

In April 1947, a controlled trial of BCG vaccination was initiated in the school population of Muscogee County, Ga. A total of 11,262 children had completed tests with 5 T.U. of PPD, and the nonreactors were tested with 100 T.U. The nonreactors to both doses were divided into two similar groups; one group was vaccinated with BCG and the other left unvaccinated as controls.

In the ensuing 12 years, 35 definite cases of tuberculosis were diagnosed among the study population, 24 among 5-T.U. reactors, 2 among 5-T.U. nonreactors who were not tested with 100 T.U., 5 among 100-T.U. reactors, and 2 each among controls and vaccinees. Three-fifths of the cases had clinically serious disease; a similar proportion were bacteriologically confirmed. There was no significant variation in type or extent of disease among the various tuberculin-vaccination subgroups of the study population. Most of the cases among 5-T.U. reactors were diagnosed during the first 5 years of observation; the few cases among nonreactors to 5 T.U. of PPD were scattered through the last 8 years of observation.

The average annual case rate for 5-T.U. reactors was 134 per 100,000; for nonreactors to 5 T.U. it was only 9 per 100,000. For both



controls and vaccinees, the rate was 7 per 100,000. There was a marked direct correlation of the tuberculosis case rate with size of reaction to the 5-T.U. dose, ranging from 8 per 100,000 among those with no induration to 199 among those with 10 mm. or more of induration. The incidence of new disease was highest in late adolescence and early adult life.

In this area of low tuberculosis infection rates, it was not possible to demonstrate any benefit from BCG vaccination during 12 years of observation.

The results of the 5-T.U. tests delineated a high-risk group, namely students with 10 mm. or more of induration. These reactors comprised only 7 percent of the study population, but furnished 80 percent of the cases during the first 5 years of observation.

It is suggested that in areas of low infection rates, which comprise most of the United States today, tuberculosis control programs among school populations might profitably be limited to periodic tuberculin testing surveys, with careful followup of reactors to a low dose.

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*A study with followup of 450 persons committed to the Medical Center for Federal Prisoners, Springfield, Mo., revealed that nearly half of 200 defendants referred for examination were found competent, brought to trial, and sentenced. Although nearly 65 percent of a group of 231 persons committed as incompetent later improved under treatment so that they were found competent to stand trial, only 15.2 percent received sentences.*

## Mental Competency Proceedings in Federal Criminal Cases

CHARLES E. SMITH, M.D., and KENNETH R. STRAWBERRY, M.A.

**W**HENEVER a person accused of crime is found to be mentally ill, two separate legal questions may be raised. The first relates to the accused's mental capacity to stand trial, receive sentence, and undergo punishment. The second question relates to whether or not the accused is to be considered responsible for his acts. This presentation is concerned solely with the first of these questions, namely, the determination of mental competency to stand trial in Federal criminal cases.

Under Anglo-American common law, mental disorder, amounting to insanity on the part of the accused, is a bar to further proceedings in a criminal case. The application of the common law rule on this issue in the Federal dis-

trict courts is nicely spelled out in the Youtsey case (1), which states, "It is fundamental that an insane person cannot plead to an arraignment, be subjected to a trial, or, after trial receive judgment, or after judgment, undergo punishment." In the Youtsey case the court also appears to have recognized that the attention of a court should be directed to the mental capacity of an accused to understand the proceedings against him, and rationally advise with his counsel as to his defense.

The disposition of the mentally incompetent accused was considered in the Forthofer case (2) which quotes, with approval from Smoot's "Law of Insanity," as follows: "The general practice is that, where the defendant is found to be insane, the trial is stopped pending the prisoner's recovery, and, until he does recover, the prisoner may be remanded to an asylum or other proper form of restraint." In this case the court also pointed out that "At common law a person could not be tried while he was insane, because his helpless condition rendered him incapable of making a proper defense."

The present legislation providing for the care and custody of insane persons charged with, or convicted of, offenses against the United States, was enacted in 1949, Public Law 285 (18 U.S.C. 4244 through 4248) (3). Prior to the enact-

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*The study was proposed by Dr. Harold M. Janney, medical director, Bureau of Prisons. The Federal Bureau of Investigation supplied data for the followup study.*

ment of this statute, Federal courts dealt with mentally incompetent or insane offenders under the general provisions of the common law.

In 1948 the late George H. Dession prepared a memorandum concerning the proposal for the present legislation in which he attributed the long-standing lack of specific statutory provisions for dealing with the mentally ill Federal offender to several factors. Traditionally, the care and custody of the mentally ill has been regarded as a State and local, rather than a Federal, function. Acceptance of this principle has limited the Federal Government's activities in the care and treatment of the mentally ill to areas which cannot be construed as competing with the States.

Originally, it was felt that the complexity of most Federal offenses tended to preclude the possibility that they would be committed by insane persons. This may have been true when the Federal criminal statutes were limited to offenses which are manifestly direct assaults against the central Government, such as treason and espionage.

However, as the scope of the Federal law has broadened to include such offenses as the white slave traffic act and the interstate transportation of stolen autos, it has become increasingly apparent that there are many Federal statutes which can be violated by mentally ill persons. In fact, a preliminary study (4) of a group of mentally incompetent Federal offenders revealed that some mentally ill persons may be especially prone to become involved in Federal offenses because their illness leads them to carry out acts which are in violation of the Federal law. Mentally ill persons who violated postal laws by depositing scurrilous, threatening, or otherwise objectionable material in the mails were notable examples.

Perhaps the most significant motivation toward the enactment of legislation for dealing with mentally ill offenders is to be found in the changing social attitudes toward mental illness, which have occurred during the past century. There is an increasing trend toward the use of psychiatry in seeking to understand criminal behavior, rather than as a means of avoiding the more severe penalties. Contrary to popular opinion, the psychiatric study of the criminal offender is no longer limited to those cases in

which a capital offense has been committed. Enlightened investigative officers, lawyers, judges, and probation officers are now learning to recognize mental illness when they see it, and no informed person today seriously denies the need for specific statutory provisions for dealing with mentally ill offenders in the Federal courts.

One of the foremost leaders in the development of legislation to deal with the insane Federal offender was James V. Bennett, director of the Federal Bureau of Prisons. In describing the need for a uniform procedure for handling these offenders, Bennett cited "the disturbing number of persons who give evidence of mental unbalance not too long after commitment under sentence" (5). In many of these cases there was considerable evidence to suggest that the offender was mentally incompetent at the time of his trial. The Federal Prison administrator also faced the problem of dealing with the offender who became insane during imprisonment and whose release might endanger the safety of Federal officers or other interests of the United States.

### **Provisions of the Present Law**

To correct these situations, the present law (3) (section 4244) provides that "whenever the United States Attorney has reasonable cause to believe that a person charged with an offense against the United States may be presently insane, or otherwise so mentally incompetent that he is unable to understand the proceedings against him, or to properly assist in his own defense," certain judicial steps shall be taken to determine the defendant's present sanity. If found to be mentally incompetent, the law (section 4246) provides that "the court may commit the accused to the custody of the Attorney General or his authorized representative, until the accused shall be mentally competent to stand trial or until the pending charges against him are disposed of according to law."

Under section 4245 of this law, there is a provision that defendants who have been sentenced, and later found to be mentally incompetent, may be referred back to the court if examination reveals probable cause to believe that such person was mentally incompetent at

the time of his trial, "provided the issue of mental competency was not raised and determined before or during said trial."

Section 4247 of the law provides for the disposition of insane prisoners whose release would probably endanger the safety of the officers, the property, or other interests of the United States. The law, which requires a judicial hearing in cases of this type, states that "if upon such hearing the court shall determine that the conditions specified above exist, the court may commit the prisoner to the custody of the Attorney General or his authorized representative."

In the Federal district courts, the application of the common law test for determining present sanity is set down in some detail in the *Chisholm* case (6). The issue is stated in this case as whether the accused has "sufficient mental power, and has such understanding of his situation, such coherency of ideas, control of his mental faculties, and the requisite power of memory, as will enable him to testify in his own behalf, if he so desires, and otherwise to properly and intelligently aid his counsel in making a rational defense." The concept is more succinctly stated in the wording of section 4244 which refers to a person "otherwise so mentally incompetent as to be unable to understand the proceedings against him or properly to assist in his own defense."

It should be recognized that the standards for determining "sanity" and mental competency under the criminal law differ from those which are generally applied in civil commitment proceedings. The legal test for determining competency to stand trial is narrower than would be applied in determining the existence of mental illness. Medical definitions of various types of mental disorders are not acceptable legal criteria for incompetency. Within this framework, it is possible for persons to be adjudged legally competent for trial while so mentally ill as to require treatment and even commitment to a mental hospital.

#### Method and Material

Since the enactment of Public Law 285, the Bureau of Prisons has had a wealth of experience in dealing with persons handled under the

several sections of the act. This paper presents some of the findings made in a statistical study of the clinical records of 200 men committed consecutively to the Medical Center for Federal Prisoners, Springfield, Mo., for psychiatric examination to determine competency to stand trial under provisions of section 4244 of the act and another 250 who were committed consecutively to this institution as incompetent to stand trial under the provisions of section 4246 of the act. The study covers commitments made from 1950 to 1957.

The data tabulated on these men included educational background, marital status, occupation and employment, offense, diagnosis, prior mental illness, prior criminal record, treatment, and disposition.

This data was supplemented with information obtained from followup inquiries made to the courts to which these persons had been returned for disposition and the hospitals to which some patients had been transferred. Finally, the Federal Bureau of Investigation records of a group of patients known to have been returned to the community were examined for evidence of new offenses.

#### Examination Procedures

All persons committed to the medical center for opinions as to competency receive complete physical, neurological, and psychiatric examinations. Social workers thoroughly explore the patient's background, and his behavior in the hospital is observed by psychiatrists, nurses, and other trained personnel.

We are in agreement with the Menningers (7) that "clinical psychology is essential to the best practice of psychiatry." Nearly 85 percent of our patients received diagnostic psychological examinations which contributed substantially to the overall understanding of these men. It may be assumed that those who were not examined psychologically could be satisfactorily diagnosed without psychodiagnostic evaluation.

The average duration of hospitalization for these examinations was 90 days. In general, the courts have accepted this period of time as necessary for the completion of these examinations. One court has ruled that "some time less

than 90 days is not an unreasonable length of time—to complete a psychiatric examination—and make a report to the committing court” (8).

Our study showed that clear-cut reasons for the referral existed in most cases. Among the reasons for referral for psychiatric study were a history of mental illness, some unusual circumstances surrounding the commission of the offense, or some unusual behavior of the defendant during detention or during his appearance in court. There were cases in which it appeared that psychiatric study was requested when members of the defendant's family or others were unable to understand or accept his criminal behavior. For these men it was desirable to rule out mental illness as a causative factor.

### Profile of a Referral Patient

An idea of the kind of individual referred for psychiatric examination to determine competency to stand trial (under section 4244, title 18) can be gained from a profile of the 200 men, constructed of medians and highest frequencies of the various factors considered. Such a hypothetical individual is single, white, and about 30 years of age. He completed a seventh to eighth grade education at the age of 15 years and departed the parental home between the ages of 16 and 17. He has no dependents and lists his occupation as either semiskilled, service, or laboring type of work. The longest period of time spent with any one employer was less than 3 years, and he had four or more jobs in the 10 years prior to his arrest. He resided in from one to three different States during this same 10-year period.

He was involved in some kind of a property crime such as automobile theft, postal theft, or forgery. He is very likely to have had a prior commitment to a mental hospital with a diagnosis of schizophrenia. He has a record of from one to three prior felony arrests, and he may have had one prior penal commitment. He was referred for psychiatric examination either on the basis of a history of mental illness or because of some unusual circumstances surrounding the commission of his offense. He has nearly 7 chances in 10 of being regarded as competent by the psychiatric examiners.

### Offenses Committed by Referral Patients

The largest single group of offenders in this series were those charged with violation of the National Motor Vehicle Theft Act. They made up 38 percent of the series. Other property offenses and nonviolent types of offenses, such as mail theft, forgery, fraud, income tax violation, Selective Service law violations, and impersonation, account for 34 percent of the series. Crimes involving assault, or threatened assault, on other persons comprise 28 percent of the series. Included in this group were such offenses as assault, homicide, kidnapping, rape, Mann Act violations, extortion, mailing obscene and threatening letters, and bank and post office robbery.

Well over half of these individuals were involved in interstate movements in the commission of their offenses. Considering the frequency with which bank robbery has been reported in the press in recent years, it is significant to note that 10 percent of the observation patients were charged with this offense, while a little less than 1 percent of all Federal prison commitments are for the offense of bank robbery.

### Diagnosis

The staff diagnosed 40.5 percent of the 200 as having some kind of psychotic condition, either functional or organic. Schizophrenia of various types was diagnosed in 28.5 percent of the group. Paranoid psychoses, including paranoid schizophrenia, occurred in 12.5 percent, and 34.5 percent were diagnosed with some type of personality disorder, with 10 percent sociopathic personalities. Neurotic disorder was found in 11 percent of the group, and 9.5 percent were found to be mentally defective.

The high incidence of psychopathology found in this group is an indication that the courts and investigative officers are employing valid criteria in the selection of cases for referral for psychiatric study. Further evidence of the effectiveness of the procedure is to be found in the fact that during the several years that the statute has been in effect, it has been necessary for the director of the Bureau of Prisons to return to the courts as probably incompetent at the time of their trials (under section 4245, title 18) only a few persons.

In a study of the operation of the Briggs law in Massachusetts, Overholser (9) reported that a little less than 16 percent of those examined were found to have some mental abnormality. This law provides for the examination of persons indicted for capital offenses, those indicted for an offense more than once, and those previously convicted of a felony. A comparison of the percentage of psychopathology found in examinations under the Briggs law with that obtained under the Federal procedures suggests that the latter may be a more economical method of separating out the mentally disordered. We believe an additional advantage of the Federal procedure is that its successful application requires a wider participation of law-enforcement people in the psychiatric casefinding process.

### **Relationship Between Offense and Illness**

A preliminary study (4) of mentally incompetent Federal offenders revealed an apparent relationship between illness and offense in the cases of paranoid individuals who had been charged with such crimes as assault, murder, and mailing threatening or otherwise objectionable letters. Statistical analysis of the group of 200 showed that nearly half of those individuals diagnosed with a paranoid disorder, including paranoid schizophrenia, were charged with offenses against persons. Forty-two percent of those diagnosed with some form of schizophrenia were charged with offenses against persons, while only 17.5 percent of those diagnosed with personality disorders were involved in offenses of this type. From these numbers, it may be deduced that nearly one out of every two Federal offenders ill with either a paranoid disorder or schizophrenia will be charged with an offense against a person, while four out of five offenders with personality disorders will be involved in property crimes.

### **Competency Opinions**

Roughly one-third of the observation patients were considered to be incompetent for trial in the opinion of the psychiatric examiners. A little over two-thirds (67 percent) of those

diagnosed as having some form of psychosis were considered to be incompetent. Approximately one-fourth of the 19 mentally defective persons were considered to be incompetent. No sociopathic or antisocial personality types were found to be incompetent. It should be apparent from these findings that a diagnosis of major mental disorder is not always accompanied by an opinion of incompetency.

### **Disposition**

Those men who were regarded as competent by the psychiatric examiners, comprising roughly two-thirds of the group, were all returned to court for disposition of the charges pending against them (fig. 1). Of those who were brought to trial, 49.5 percent of the original 200 received prison sentences. Followup revealed that all but 5 of the 99 sentenced were making a satisfactory adjustment to imprisonment. Other persons who were considered to be competent were either placed on probation or released when the charges were dropped.

Patients found to be incompetent, comprising a third of the total group, were disposed of by hospitalization in State or veterans institutions or recommitted to the medical center under section 4246. Those returned to Springfield comprise 10.5 percent of the original 200.

### **The Mentally Incompetent Offender**

The mentally incompetent offender can be viewed broadly in the results of our study of 250 men committed consecutively to the medical center under provisions of section 4246, title 18. About 40 percent underwent their initial examinations for competency determination as hospital inpatients, some at Springfield. The balance were examined as outpatients in office, clinic, hospital, and jail settings. Less than a third of these 250 offenders received psychological examinations as part of their initial study. Clear-cut reasons for the initial referral for psychiatric study were apparent for all but a few.

Although all these offenders were committed to the medical center as incompetent, the opinion as to incompetency was sustained by the psychiatric examiners at the medical center for a little

less than 80 percent of the group. For the most part, the differing opinions with regard to competency were the result of differences in diagnosis. Experience has shown the benefit of hospital study in difficult cases. As in the observation group, nearly 85 percent received psychological studies at the medical center, which often helped to clarify the diagnosis.

### **Profile of the Incompetent Offender**

We have also assembled a profile of those defendants who were committed as incompetent. The resulting hypothetical incompetent Federal offender is a single, white male about 30 years of age. He left school at the age of 15 after completing approximately the eighth grade. He left the parental home between the ages of 16 and 17. He lists no dependents, and his occupation is either farming, laboring, or service-type work. The longest time spent with any employer was less than 1 year, and he has had four or more jobs in the 10 years preceding his arrest. (One-third of the individuals in this group had no significant employment record.) Our representative offender has resided in several States or in an institution during the 10 years preceding his arrest. The possibilities that he has been charged with an offense involving actual or threatened harm to another person or a property crime are almost equal.

He has a history of prior commitment to a mental hospital with a diagnosis of schizophrenia. He also has a history of three to five prior arrests on felony charges and may have one prior commitment to a penal institution. He has been referred for psychiatric study because of a history of prior mental illness or because of unusual circumstances surrounding his offense. He is likely to have been diagnosed as having some type of schizophrenia (two-thirds of the group) or he has predominantly a paranoid psychosis of one kind or another (one-third). His prognosis is either poor or guarded.

### **Prior Hospitalization of Offenders**

A history of prior hospitalization for mental illness was found in 62.5 percent of the 250, and nearly half of the group had a history of at least one prior penal commitment. Almost 38

percent had been known at some time to a Government-sponsored mental facility, either a military or veterans hospital. Nearly 19 percent of the group had been beneficiaries of the Veterans Administration because of mental disorder.

### **Offenses and Diagnosis**

As in the observation group, the single offense which occurred with the highest frequency was auto theft, comprising 21.9 percent of the series. A total of 56.2 percent were involved in auto theft, other property crimes, and miscellaneous nonviolent offenses. The balance of these individuals (43.8 percent) were charged with offenses which involved either actual or threatened harm to some other person.

For 62.3 percent of these men a diagnosis of some type of schizophrenia was made. Mental deficiency was diagnosed in 5.2 percent and the balance carried various diagnoses including psychotic depressions and organic psychoses. A total of 37.8 percent of the group had psychotic conditions in which paranoid symptoms predominated, including paranoid schizophrenia.

### **Relationship Between Offense and Illness**

In considering possible relationships between diagnosis and offense we found that nearly half (45.4 percent) of the offenses against persons were committed by individuals with some type of paranoid illness. Since nearly 38 percent of the men in this series were diagnosed as having significant paranoid illness, it becomes increasingly apparent that the paranoid individual, in terms of numbers, chronicity of illness, and seriousness of his offense, constitutes a substantial portion of the total problem of the mentally incompetent Federal offender.

### **Treatment**

At the medical center these patients received milieu and the ancillary therapies, individual psychotherapy, insulin coma therapy, electroconvulsive treatment, and tranquilizing drugs, either singly or in combination. In the pre-tranquilizer era nearly 30 percent of the pa-

**Figure 1. Disposition by percentage of 200 observation patients referred to the Medical Center for Federal Prisoners under section 4244, Public Law 285**

<b>Found incompetent (32)</b>	<b>Transferred to State or V.A. hospital (22)</b>
	<b>Returned to Springfield (10)</b>
<b>Found competent (68)</b>	<b>Sentenced to prison (53)</b>
	<b>Received probation (10)</b>
	<b>Released after hearing (4)</b>
	<b>Released without hearing (4)</b>

tients received either electroconvulsive or insulin coma treatment. With the introduction of the tranquilizing drugs at the medical center in 1954, use of the physical treatments declined. They are administered to only a few patients, while the drugs are given to about 30 percent of the patients. In substance, it appears that the same types of patients who were treated earlier with the physical therapies have been more recently treated with the drugs.

The rates of recovery and the duration of hospitalization for recovered patients during the period when the physical therapies were in use have not differed markedly from those during the period when tranquilizing drugs were employed. For instance, half of the schizophrenics committed in 1951 recovered sufficiently to be returned for trial during an average period of hospitalization of 217 days. On the other hand, a little over one-third of the schizophrenics admitted during 1956 recovered sufficiently to be returned for trial within an average period of hospitalization of 321 days. Differences between the results obtained during

these 2 years can be readily explained on the basis of differences in the chronicity of the illness of persons admitted during these years, there being more chronically ill patients admitted during 1956.

Leaving aside differences in recovery rates which are known to occur in different classes of illness, the results of our study offer incontrovertible evidence that severely mentally ill persons awaiting trial can be successfully treated. To those who theorize that poor motivation will impede the recovery of such patients, our results may seem to be something of a paradox.

### **Disposition**

Studies of the first 231 persons, all of whom had been followed for 1 year or more, showed that 64.5 percent were returned to court as competent (fig. 2). However, only about half of the 231 were brought to trial. The end result was that 15.2 percent of the group received sentences, 9.1 percent were placed on probation.



Figure 2. Disposition by percentage of 231 mentally incompetent offenders followed for 1 year or more who were referred to the Medical Center for Federal Prisoners under section 4246, Public Law 285

Returned to court as competent (65)	Sentenced to prison (15)
	Acquitted, insane at time of offense (26)
	Received probation (9)
	Released without trial (11)
Remained incompetent (35)	Hospitalized - State or V.A. facility (4)
	Transferred to State or V.A. hospital (33)
	Remained at Springfield (2)

and 10.9 percent were released without a trial. Nearly 40 percent of those returned to court as competent were acquitted by reason of insanity at the time of the offense.

One-third of the 231 patients were eventually transferred from Springfield to various mental hospitals in their States of residence when they failed to improve sufficiently under treatment to be regarded as competent. At the time this was written only a handful of the original group of 231 remained at Springfield.

Our records show that 86 of the 231 were transferred to State hospitals, 77 from Springfield and another 9 under arrangements made by the courts. At the time this report was prepared, 44 of these 86 men remained in State hospitals, 31 had been released from these hospitals, and 11 were reported as eloped or escaped. For many of these men the period of hospitalization was relatively brief.

All but 18 of the 86 who were transferred to State hospitals had some form of schizophrenia. Thirty-nine had paranoid schizophrenia, and

one was diagnosed as having a paranoid psychosis other than schizophrenia. Of the 40 with paranoid psychoses, 23 remained in the hospital at the time this report was written.

#### Subsequent Arrests and Hospitalization

An examination of the current Federal Bureau of Investigation records of 183 persons known to have been released revealed that 23 percent had been rearrested within 1 year. These records showed that another 13 percent had been rearrested within a period of 2 to 4 years of their release. In addition, the FBI records showed 15 percent were readmitted to a mental hospital over a 5-year period. It is probable that there were other hospital readmissions which were not recorded in these records. From these numbers it is apparent that a very substantial number of these men will continue to be known to police and hospital authorities.

Several interesting things were noted in our study of the subsequent records of the 67 indi-

viduals who had been rearrested following their release from Federal custody. In nearly every instance, the new offense was similar to the offense for which the man had been previously arrested. Eight, or 12 percent, were charged with offenses which involved direct assaults against other persons. All but one of these eight had previously been diagnosed as having some type of schizophrenia, three having been diagnosed as paranoid schizophrenics.

Two of the rearrests were on charges of murder. One of those charged with murder had been previously diagnosed as having simple schizophrenia and the other was diagnosed as a psychopathic personality with psychotic reaction.

In checking on the paranoid schizophrenics who had been charged with offenses against persons, it was found that most of them continued to be hospitalized. While these results show a relatively high rate of recidivism among the mentally ill offenders, it appears that the community is being reasonably well safeguarded from further depredations by those mentally ill offenders who are known to be of the most dangerous type.

#### Comment

Weihofen (10) has stated that "any reform in the method of trying persons alleged to be insane probably will come through perfecting means for preventing the trial of mentally diseased and deficient persons." Overholser (11) has stated that "we should look to the development of practices on the part of the legal-medical professions which will, so far as possible, avoid not only bias and venality, but the suspicion of them." The Federal statutes are designed to achieve these desirable goals. They provide for impartial psychiatric examinations which prevent incompetent defendants from being subjected to trial and punishment.

About 20 years ago Dession (12) stated "All too frequently the comprehensive and searching picture of an offender revealed by psychiatric case history and diagnosis will serve chiefly to bring out in bold relief the essentially primitive character of all alternatives open for his disposition within existing institutional frames." Today, the proper disposi-

tion of the mentally ill offender remains a complex problem. Offenders with residual mental illness may be adjudged legally sane and then released into the community following a finding of not guilty by reason of insanity at the time of the offense. Some mentally ill offenders are returned to the community prematurely, after having been disposed of as too ill to appear for trial.

Treatment programs for the so-called criminally insane have been neglected. Duval (13) has stated that "the development of new programs in the treatment of criminally insane depends largely on community understanding for its ultimate success."

We believe that the disposition of these difficult cases will be facilitated as psychiatrists and lawyers gain a better understanding of their joint responsibilities in this field. Familiarity with the law and its philosophy will enable psychiatrists to make recommendations which are realistic and feasible within the legal framework governing the disposition of a given case.

In addition, lawyers need to know more about the nature of mental illness. They must know enough about psychiatry to be able to recognize that the concept of "legal sanity" is not always synonymous with that of good mental health. Recognition of shortcomings in the legal provisions by both lawyers and psychiatrists can lead the way toward constructive reforms.

Facilities for the effective treatment of the mentally ill offender must be expanded. It is likely that rates of recidivism in this group could be reduced by providing followup services to insure necessary treatment either as an outpatient or an inpatient, as the person may require.

#### Summary

The broadening scope of Federal criminal statutes and growing enlightened interest in the mentally ill has led to the enactment of legislation providing for the care and custody of insane persons charged with or convicted of offenses against the United States. These provisions are designed to prevent the trial and sentencing of mentally incompetent offenders.

This paper presents some of the results of a comprehensive study of 200 men committed to the Medical Center for Federal Prisoners, Springfield, Mo., for psychiatric examination to determine competency to stand trial; and another 250 who were committed to this institution as incompetent to stand trial.

Our studies show that Federal courts order psychiatric examinations to determine competency in the cases of individuals charged with a wide variety of offenses, ranging from homicide to forgery to auto theft. Some socioeconomic characteristics of mentally ill offenders are presented.

Significant psychopathology was found in a large percentage of those referred for psychiatric study, with 40.5 percent diagnosed as actively psychotic. Nearly half (49.5 percent) of the defendants who were referred for examination to determine competency were later brought to trial and received sentences.

It was found that many defendants who are committed as incompetent, pending trial for their offenses, can be improved under treatment so that they are competent to stand trial. In this series, nearly 65 percent of those who had been declared incompetent were eventually returned to court for trial, with 15 percent receiving sentences.

Defendants suffering with paranoid illnesses constitute a substantial portion of the total problem of the mentally incompetent Federal offender, in terms of numbers, chronicity of their illness, and seriousness of their offenses. These individuals are prone to commit offenses against persons. The procedures which are being followed in the disposition of these men operate to protect the community against the further depredations of these more dangerous types of mentally ill offenders.

Followup studies suggest the need for increased facilities for the hospital treatment and aftercare of mentally ill offenders. There are indications that some mentally ill offenders are returned to the community prematurely after

having been disposed of as too ill to appear for trial.

Lawyers and psychiatrists must continue to work together for mutual understanding in fulfilling their joint responsibilities in arranging for the effective disposition of the mentally ill offender. In accomplishing this goal, it is important to recognize that the concept of "legal sanity" is not always synonymous with a state of good mental health.

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# Rehabilitation Care in Nursing Homes

WILFORD E. PARK, M.D., and MILDRED I. MOE, R.N.

**D**EMONSTRATION of the value of rehabilitation nursing of elderly patients in nursing homes was the object of a 1-year project in Minneapolis in 1958-59. The project was the outgrowth of an earlier and still continuing educational and surveillance program of the Minneapolis Health Department and of the interest of the Kenny Institute in wider use of its rehabilitation nursing techniques.

For several years, the Minneapolis Health Department has been conducting a vigorous surveillance and educational program in the city's nursing homes, under deputized authority from the Minnesota Department of Health. Minneapolis, a city of approximately 527,000 people, has 65 licensed nursing homes with a total of 2,632 beds. Eleven of these homes, with a total of approximately 870 beds, are for elderly well people. Forty homes are under the guidance of nurses-in-charge who are registered nurses; the remainder are supervised by licensed practical nurses.

All nursing homes in Minneapolis are visited on an average of nine times a year, and, at each visit, the emphasis is on helping the administrators and nurses. Various grading systems have been tried and revised. The most useful is that currently in use, the "Minneapolis Scoring System" (1). This system has made it possible to measure progress and to pinpoint the areas where improvements are needed.

## Educational Program

Early in the educational program it was recognized that many defects and deficiencies in nursing homes were being perpetuated because neither the nursing staff nor the nursing home administrators knew how to do a better job. The philosophy that the aged were in the homes

simply to wait for death was all too common, and little effort was being made to improve the health of the patients or their enjoyment of the time remaining to them. If nursing care was to improve, nurses' aides needed some training either through inservice training or through some outside program. Also, the nurses-in-charge needed a much better appreciation of their responsibilities for supervising nurses' aides, controlling medicines and treatments, contacting and informing attending physicians about their patients, obtaining up-to-date doctors' orders, and keeping accurate and meaningful records. All this added up to a crying need for training at all levels.

At the beginning of the program classes were held in various nursing homes, and the nursing staffs from neighboring homes were invited. The number of persons wishing to participate quickly mounted to more than 100, and it was realized that fewer people and longer sessions would be more practical. A room equipped with a hospital bed and bedside nursing equipment was set aside in the public health center as a classroom. Teaching charts were prepared, and a 2-day course in basic nursing was designed. Classes, limited to about 20 students by an advance appointment system, are being conducted 2 days a week, with the same nurses' aides attending both days. Each aide is provided with an experience record card on which

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each of the more than 50 procedures taught is initialed by the teacher. After the aide has demonstrated satisfactory performance of a procedure, the nursing home supervisor initials the item. This card, certifying the aide's degree of proficiency, is a valuable document, which she can show to her employer or to any future employer.

The cooperation of the nursing homes, hospitals, doctors, and nurses has been excellent, and outstanding progress has been made (2-5).

### Kenny Institute

In 1957 the medical staff of the Kenny Institute in Minneapolis became interested in extending their rehabilitation nursing techniques to a larger number of handicapped people. The staff felt that hospitals, nursing homes, and public health officials might be interested in such a project. The institute set up a series of 1½-day classes, and representatives of these groups were invited to attend.

The Minneapolis Health Department was quick to realize the contribution which the Kenny Institute could make to rehabilitation nursing. With assistance from the Kenny Foundation, arrangements were made to send two nurses at a time from the combined nursing service of the health department and the Visiting Nurse Service to work on the wards of the institute for 10- to 12-week intervals. The health department felt that nurses so trained, when attending patients in their homes, would apply and teach patients and their families the nursing techniques used at the Kenny Institute, with primary emphasis on maintaining remaining muscle function and on prevention of unnecessary contractures. By the time the health department was prepared to embark on a demonstration of rehabilitation nursing in nursing homes in October 1958, 8 or 10 nurses in the combined nursing service had had the Kenny Institute experience.

### Rehabilitation Nursing Project

Early in 1958 the health department undertook an extensive educational program for nursing home administrators and their nursing staffs. The acceptance of the program was

very gratifying, and it was challenging to find that nursing home personnel wanted to do a better job of caring for their patients and were only too anxious to learn how to accomplish it.

In the fall the commissioner of health for Minneapolis authorized a 1-year demonstration project in rehabilitation nursing in nursing homes, which would be supplemental to the established surveillance and educational program. Six public health nurses who had completed their work on the wards of the Kenny Institute were assigned to work with and under the immediate supervision of the nurse adviser for rest homes for one-half day per week.

The important but simple booklet "Strike Back at Stroke" (6) illustrates techniques of handling partially paralyzed people which are very similar to those employed by the Kenny Institute. This publication, along with "How to be a Nursing Aide in a Nursing Home" (7), teaching guides used by the Kenny Institute, the Minneapolis General Hospital, and the American National Red Cross, and other books on rehabilitation nursing provided background and reference materials.

The project was organized and guidelines outlined through consultations among the leading participants and supervisors of the combined nursing service.

### Anticipated Benefits

It was anticipated that the program would demonstrate that some patients in nursing homes would be restored to self-sufficiency or made much more self-sufficient.

It was also anticipated that the program would provide other benefits, such as:

- Improvement in the general quality of nursing care.
- Recognition by the nursing home of the value of regular inservice training and establishment of a desire to continue such training.
- Improvement in the general morale of the nursing staff.
- Improvement in the general atmosphere of the nursing home and in the morale of the patients.
- Upgrading of the home as a result of improvements resulting from participation in the project.

- Beneficial publicity for the home.
- Improvement in public relations.
- Stimulation of other nursing homes to make improvements in their homes, in order to maintain their competitive positions.

- Benefits to participating members of the Minneapolis combined nursing service from the teaching experience gained.

- Additional impetus and recognition received by the Minneapolis Health Department.

- Greater appreciation by training schools for nurses and practical nurses of the need for more trained people in nursing homes.

- Recognition by nursing home associations of the value of cooperative inservice training, leading them to undertake to develop and maintain teaching programs of their own.

## Groundwork

The proposed demonstration was explained in detail to groups which might be interested in or affected by it. Letters describing the project were sent to the president and the executive secretary of the Hennepin County Medical Society, and the society's Committee on Nursing Homes. The board of directors of the medical society subsequently enthusiastically approved the project. Letters were also sent to the Minnesota Department of Health, the Minnesota Board of Nursing, and the Minnesota Department of Education, explaining the project and assuring them that no attempt would be made to issue diplomas nor to interfere in any way with their regular teaching and licensing procedures.

Meetings were held with the supervisory staff of the Kenny Institute and the executive staff of Hennepin County Welfare Board. At a regular meeting of the Twin City Nursing Home Association the project was explained fully and the approval and moral support of the association were obtained. The Twin City Nursing Home Association was advised that the commissioner of health proposed to place the participating homes in competition and to award a citation to the nursing home making the most improvement during each competition period. The county welfare board agreed to cooperate in the appraisal of patients and not to reduce payments to nursing homes for any

patient given intensive rehabilitation nursing, until the end of the demonstration period, no matter how self-sufficient the patient became.

## Project Design

The demonstration was designed to operate in six nursing homes for 6 months and to transfer to six other nursing homes for a second 6 months. The procedures followed were the same in both groups of homes.

Six participating homes were chosen, and one public health nurse was assigned to work in each home for the same half-day each week. The homes selected were all about the same size, the quality of service provided was similar, and the patients were of the same type and age. Patients with disabilities and limitations were chosen for rehabilitation nursing without regard to their prospects of benefiting from the techniques. Six or more nursing homes similar in size and comparable in type of patients to the participating homes were selected as controls. One home for the aged was included in each group. Nurses were not assigned to work in the control homes, but the homes were evaluated on the same basis as the participating homes. In both participating and control homes the nurse adviser explained the project fully to administrators and nurses-in-charge and obtained their cooperation.

The nurse adviser and the county welfare worker jointly selected and appraised individual patients for intensive rehabilitation nursing in the participating homes and selected similar patients in the control homes. Both participating and control patients were elderly and were suffering from disabilities resulting from strokes, old fractures, arteriosclerosis, paralysis agitans, arthritis, amputations, and so on.

For each patient selected in the participating homes, the nurse adviser obtained the approval of the attending physician and the consent of the patient's relatives for him to receive intensive rehabilitation nursing care. Whenever possible, personal interviews were held with the physician, at which time the project was explained fully and his support obtained. When a personal interview could not be arranged, the evaluations were sent to the physician for

each of the more than 50 procedures taught is initialed by the teacher. After the aide has demonstrated satisfactory performance of a procedure, the nursing home supervisor initials the item. This card, certifying the aide's degree of proficiency, is a valuable document, which she can show to her employer or to any future employer.

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- Improvement in the general morale of the nursing staff.
- Improvement in the general atmosphere of the nursing home and in the morale of the patients.
- Upgrading of the home as a result of improvements resulting from participation in the project.

## Nursing Staff—Continued

Number	Item	Start			3 months			6 months		
		1	2	3	1	2	3	1	2	3
16.	Is patient teaching practiced with emphasis on aid to daily living?									
17.	Does staff have a healthy attitude toward the aging?									
18.	Is each patient approached with a positive attitude toward rehabilitation?									
19.	Does staff understand doctor's order as to patient's limitation?									
20.	Can staff interpret doctor's orders as to "within pain limits"?									
21.	Does staff know which exercises they must do and those which a patient can do?									
22.	Are basic principles carried out in making up a bed for a rehabilitation patient?									
23.	Does staff know how to:									
	a. Assist a patient to a sitting position?									
	b. Transfer a patient from a bed to a wheelchair?									
	c. Propel a wheelchair?									
	d. Transfer from wheelchair to bed?									
	e. Wheelchair to toilet?									
	f. Transfer from wheelchair to bathtub?									
	g. Transfer from wheelchair to armchair?									
24.	Does staff carry out active or passive exercise?									
25.	Does bedside care include "range of motion"?									
26.	Is home interested in our Home Improvement Program?									
27.	Are extra classes incorporated to make staff better qualified to share this program?									
28.	Have any reference books been added for staff education?									
29.	Morale of nursing staff.									
30.	Is patient contentment and well-being affected?									
31.	General level of care provided in home.									
32.	Equipment to carry out rehabilitative measures more effectively.									

List equipment added

Remarks:

emphasis on the nursing homes in the demonstration project, except as she worked with and supervised the six public health nurses assigned to the participating homes.

To stimulate competition and promote publicity, awards were promised to the nursing homes making the most improvement during the demonstration period. The awards were in the form of framed embossed citations which the nursing homes could hang for public display. The awards were presented at regular meetings of the Twin City Nursing Home Association, and the local newspaper carried news items regarding them.

## Evaluations

All evaluations of participating patients and control patients were made jointly by the nurse adviser and a county welfare worker. The original evaluations, and in most instances the final evaluations as well, were verified by the attending physician. The evaluation form provided a choice of three columns for recording each patient's status. These columns were headed "Total care," "Needs help," and "No help." A fourth column was headed "Remarks." Items were grouped under such broad areas as bed status, mobility, personal needs, dressing, continence, mental condition, and



Name of home \_\_\_\_\_ Address \_\_\_\_\_ Phone \_\_\_\_\_  
 Superintendent or manager \_\_\_\_\_ Nurse in charge \_\_\_\_\_ LPN, RN (encircle)  
 Doctor on call \_\_\_\_\_ Phone \_\_\_\_\_ Number of patients by license \_\_\_\_\_  
 Number on nursing staff at start \_\_\_\_\_ 3 months \_\_\_\_\_ 6 months \_\_\_\_\_

Evaluation Rating: 1—Unsatisfactory, 2—Satisfactory, 3—Good

[illegible]

1. Care of bed patient with frequent change of position.
2. Care of seriously ill.
3. Is total patient care understood? Adjusting environment to encourage self-help.
4. Are total patient's needs supplied?
5. Does staff understand what constitutes good patient position?
6. Are body mechanics understood in this home?
7. Is rehabilitation understood?
8. Is any intensive nursing therapy practiced?
9. Is preventive therapy emphasized?
10. Does staff understand what is meant by preventable conditions?
11. Are nursing measures used to prevent contractures?
12. Are bedsores given prompt regular care?
13. Are incontinent patients given bedpan or urinal regularly?
14. Is the patient given training in bowel control?
15. Does staff understand the meaning and effect of stroke, senility, heart disease and similar diagnosis?

The public health nurses, under the direction of the nurse adviser, conducted teaching programs in the nursing homes participating in the demonstration. The nurse-in-charge and the nurses' aides gathered around the selected patients and the public health nurse taught and demonstrated rehabilitation nursing techniques. Among items covered were

During the demonstration, the nurse adviser continued the regular educational program begun early in 1958 for all nursing home administrators and their staffs without particular

**Table 2. Status of control patients at end of demonstration**

Nursing home	Number patients at start of demonstration	Number patients followed throughout	Number patients by changes					
			Transferred	Died	Worse	No change	Better	Markedly better
1-----	2	2	0	0	0	1	1	0
2-----	4	4	0	0	0	2	1	1
3-----	7	7	0	0	0	4	3	0
4-----	6	5	0	1	0	4	1	0
5-----	5	4	1	0	0	4	0	0
6-----	4	2	0	2	0	1	1	0
7-----	10	5	4	1	0	5	0	0
8-----	12	11	1	0	0	11	0	0
9-----	12	10	0	2	2	8	0	0
10-----	10	8	1	1	0	8	0	0
11-----	6	5	0	1	0	2	3	0
12-----	8	5	1	2	0	5	0	0
13-----	5	5	0	0	0	3	1	1
Total-----	91	73	8	10	2	58	11	2

of the patients get up and dress during the day and everyone gets a tub bath. The working morale is excellent and this is reflected in their attitudes toward the patients."

The impact of the demonstration program on the participating homes was measured in many different ways, and the same evaluations were applied to the control homes. Eight scoring items were used in evaluating the homes in competition for the awards. The criteria used were: purchase of hospital room furnishings, such as beds, mattresses, bedside tables; evaluation of functions of the nurse-in-charge and functions of the nursing staff in the three categories—unsatisfactory, satisfactory, good or excellent—scored at the beginning of the demonstration and at the end of 3 months and 6 months; attainment count, based on the evaluation record; narrative comment; patient improvement; participation in instruction classes; redecorating building; and purchase of equipment, especially for the use of nurses, such as manuals, teaching aids, and filing equipment.

The most important of the evaluation forms was the Nursing Home Improvement Evaluation Record (p. 608). This form provides a checklist which was used by the nurse adviser at the start, at the 3-month interval, and at the end of the 6-month period, and was chiefly concerned with the impact of the program on the nursing staff. On the form, the nurse-in-charge was rated unsatisfactory, satisfactory,

or good on 11 items and the nursing staff on 32 items.

Competition was keen among the participating nursing homes. During the first 6-month period, five homes chalked up creditable scores, with one winning the award citation. During the second 6-month period, three nursing homes ran so closely together, and away out in front, that each was awarded a citation.

### Conclusions

The rehabilitation nursing demonstration was so successful that all of the objectives and anticipated benefits were accomplished except the increased appreciation of training schools of the need for more trained people in nursing homes, and recognition by nursing home associations of the value of cooperative inservice

**Table 3. Percentage of change among patients followed<sup>1</sup>**

Category	Number	No change (percent)	Better (percent)	Markedly better (percent)
Participating-----	78	51.3	28.2	20.5
Control-----	71	81.7	15.5	2.8
Net improvement-----	-----	-----	12.7	17.7

<sup>1</sup> Exclusive of patients who died or became worse.

motivation. The letter S was inserted in the appropriate column opposite the item to designate the patient's status at the start, the figure 3 to designate the 3-month evaluation, and the figure 6 to designate the 6-month evaluation. The doctor's order sheet was attached to the evaluation form.

The effect of rehabilitation nursing on selected patients is shown in table 1. Table 2 shows the status of the control patients at the end of the demonstration. In table 3, total changes are expressed in percentages after eliminating patients who died or were transferred to other facilities and those who became worse due to natural deterioration.

While less than 50 percent of the patients receiving intensive rehabilitation nursing were benefited, nevertheless, about 30 percent showed significantly more improvement than the control group (table 3). This accomplishment is all the more significant when it is realized how unpromising some nursing home patients are and that no physiotherapy was used. The following cases illustrate some of the accomplishments.

One elderly lady who had had a stroke in 1949 and had fractured her hip in 1950 had been bedridden ever since and was only out of bed when lifted. After intensive care, she was able to transfer from bed to wheelchair with little help, operate the wheelchair alone, dress herself, and is now living a much happier life.

An inoperable cancer patient who was pre-

viously bedfast and receiving complete care became entirely self-sufficient, up and dressed every day, walking about with an air of dignity and self-respect not previously manifested.

With a patient who was fearful and resistant, the indirect approach worked out very well. Mrs. A was an elderly leg amputee who had been a total care patient for about 2 years. She had been out of bed and in a wheelchair only when lifted by nurses. Her doctor said she could be up and about on crutches if she wanted to. She refused to try any exercises so another leg amputee was placed in the room with her. Rehabilitation nursing techniques were carried out on her roommate. Surreptitiously Mrs. A began doing the exercises she saw her roommate doing and eventually she became largely self-sufficient. Mrs. A improved to the extent that she left the nursing home and went by airplane to live with her daughter in California.

The following comment from a nurse's letter speaks for itself: "It is a good feeling to see patients come into our home unable to move their extremities on one side and one day see them walk down the hall with little or no assistance."

One public health nurse, reporting on the home she served, wrote "All the nurses have a good knowledge of the range of motion exercises, wheelchair transfer, and other rehabilitative nursing procedures. They are proud of the fact that not one bedpan is used, that all

Table 1. Status of patients given intensive rehabilitation nursing care at end of demonstration

Nursing home	Number patients at start of demonstration	Number patients followed throughout	Number patients by changes					Markedly better
			Transferred	Died	Worse	No change	Better	
1-----	7	7	0	0	0	1	3	3
2-----	4	4	0	0	0	3	0	1
3-----	9	8	0	1	1	6	1	0
4-----	8	6	1	1	0	5	1	0
5-----	7	6	0	1	1	4	0	1
6-----	5	5	0	0	1	2	2	0
7-----	12	12	0	0	0	3	4	5
8-----	5	5	0	0	0	2	1	2
9-----	9	9	0	0	0	6	2	1
10-----	8	8	0	0	0	3	3	2
11-----	7	7	0	0	1	1	4	1
12-----	6	5	0	1	0	4	1	0
Total-----	87	82	1	4	4	40	22	16

year. During that time, intensive rehabilitation nursing was demonstrated in 12 nursing homes on selected patients with the authorization of the patients' own physicians. The impact of the program on 78 individual patients was measured and compared with 71 control patients who were followed during the same period. The impact of the program on the 12 participating nursing homes was also evaluated and compared with 12 control homes, similarly evaluated.

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## films

### The Nurse Epidemiologist

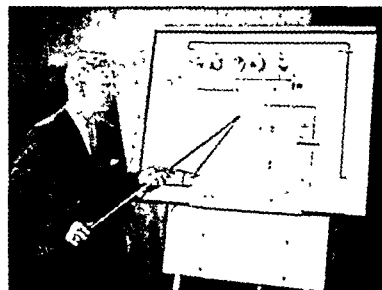
35-mm. filmstrip, color, sound, 95 frames, 14 minutes, cleared for television, 1959. (Order No. F-361.)

Audience: Hospital and public health nurses, nursing students, and allied personnel.

This filmstrip outlines the knowledge, duties, and responsibilities of the public health nurse in an epidemiological investigation, including sequences on identification of specific epidemiological patterns of time, place, and persons; the spread

of pathogenic organisms; how disease organisms reach the various portals of entry; and chronological order of the nurse's duties during an investigation.

Prints are available on short-term loan, United States only, from the Communicable Disease Center, Public Health Service, Post Office Box 185, Chamblee, Ga. They can be purchased from United World Films, Inc., 1445 Park Ave., New York 29, N.Y., list price \$9.10.



of pathogenic organisms; how disease organisms reach the various portals of entry; and chronological order of the nurse's duties during an investigation.

The film can be used as an aid for organizing scheduled lectures. It shows how to use the "Swimming Pool Sanitation Color Charts," and suggests training aids for the presentation.

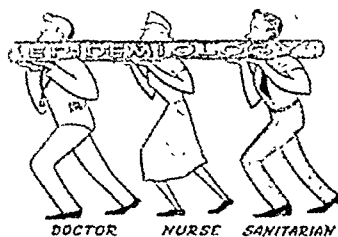
It is available for purchase, \$179.17 list, from United World Films, Inc., 1445 Park Ave., New York 29, N.Y., or obtained on short-term loan (United States only), from the Communicable Disease Center, Public Health Service, Post Office Box 185, Chamblee, Ga.

### Introduction to Swimming Pool Sanitation

16-mm. motion picture, color, sound, 23½ minutes, 846 feet, 1959, not cleared for television. (Order No. M-402.)

Audience: Public health personnel, pool operators, environmental hygienists, and others concerned with swimming pool sanitation.

An introductory lecture for courses in swimming pool sanitation, the film uses as a guide the introductory lecture given on pages 15-21 of the manual "Swimming



training and development and maintenance of teaching programs. However, further developments may take place in these two areas.

The impact of the demonstration project on most of the participating nursing homes was markedly evident, as manifested in better nursing service, better morale among both staff and patients, and striking improvements in the physical appearance of the homes.

Some benefits were not entirely foreseen. For instance, getting people up during the day and the marked success in bowel and bladder training reduced the amount of laundry, practically eliminated bedsores, and greatly reduced the back care and bedpan service falling on the unpopular 3 to 11 p.m. nursing shift. Nursing staff became more stabilized, nurses more interested in further training and in using reference books. Nurses began to see the real function of occupational therapy as practiced by registered therapists. Even nursing homes outside of the demonstration project began to increase their emphasis on occupational therapy, to participate more fully in educational opportunities, and to build up their own nurses' reference libraries. In the participating homes a spirit of optimism was evident everywhere and was justified by the successful efforts of the patients to help themselves and to participate in more communal living.

The demonstration itself, and the publicity associated with the granting of awards, had a stimulating effect on all the nursing homes in the city, and interest in improving them was definitely deepened. The demonstration also served to dispel part of the pessimistic attitude of doctors, nurses, and relatives toward patients in nursing homes.

The demonstration substantiated the belief that the Kenny Institute's rehabilitation nursing techniques and other similar published rehabilitation nursing techniques can be learned and applied by nursing staffs in nursing homes.

Experience showed that acceptance of the principles of rehabilitation nursing and the enthusiasm of the nurse-in-charge were the factors of primary importance.

The study also showed that intelligent nurses' aides can carry out the techniques after they have been given some grounding in basic nursing, an elementary description of each patient's

physical and mental condition, and taught specifically what to do for each patient.

The nurses' aide should have ready access to a supervising nurse or a consultant who has had special training in rehabilitation nursing. The on-the-ward training at Kenny Institute does provide that needed training, but careful reading of written and illustrated materials such as "Strike Back at Stroke" (6) and many others also gives sufficient guidance when combined with knowledge of the patient's condition and specific doctor's orders.

The demonstration showed that much can be accomplished in preservation of function and restoration of activity within the framework of nursing techniques without infringing on the field of physical therapy. This has real significance in view of the severe shortage of trained physical therapists.

The patients under study received no physiotherapy but were given intensive rehabilitation nursing care such as is practiced at the Kenny Institute in Minneapolis and by other rehabilitation centers. The study showed significant improvement in 48.7 percent of the patients given intensive care as compared with 18.3 percent of the control patients.

The impact on the participating nursing homes was even more significant. Under the scoring system used, the average number of points scored by the 12 participating homes out of a possible 294 was 126.5, with a high of 188.5 as compared with an average of 48.7 points, and a high of 91.5 by the 12 control homes. While it is admittedly difficult to measure improvement mathematically, there can be no doubt about the tremendous improvement which took place in the majority of the nursing homes which participated in the demonstration project.

Future plans of the Minneapolis Health Department include the continued promotion and teaching of rehabilitation nursing as a part of the already established educational program in Minneapolis nursing homes. This will require one additional nurse but the benefits will be available to all nursing homes in the city on a continuing basis.

The demonstration of rehabilitation nursing was conducted by the Minneapolis Health Department and extended over a period of 1

of many deviations from normal health can be revealed by case histories. The use of a stereotyped form is not permitted. Such a device, we believe, may convey to the patient the impression that the caseworker must resort to the use of a memory aid, thus threatening the patient's confidence and destroying many of the virtues of the more personalized approach. The caseworker knows the object and significance of the history, she knows what questions to ask and why she asks them, and her training and judgment supply the only aids she requires.

Twenty-five minutes is allotted to each interview with the caseworker. In addition to taking a medical history, the caseworker takes the blood pressure and pulse rate and determines visual adequacy, using the telebinocular apparatus.

A tangible, though incidental, byproduct of history-taking is its educational value to the layman. When a patient is asked about a change in bowel habit, the presence of a watery vaginal discharge, night sweats, increased thirst, dyspnea on exertion, or precordial pain, she receives an impression of the importance of these symptoms. It is conceivable that this impression will cause her to consult a physician at once should these symptoms occur at a future date, rather than to procrastinate.

Twelve patients a day can be surveyed by a two-person team working from 6 to 7 hours and using the described technique. During the survey, a day at the plant site is alternated with a day at the home office, where tests are completed, notes taken are transcribed into permanent records, and equipment is prepared for the next day's needs.

Both histories and laboratory reports are reviewed carefully, analyzed, and evaluated by the medical director. Any significant findings suggestive of existing or potential abnormality are noted and reported to the physician designated by the patient. All case studies are classified and processed according to the findings. Appropriate reports are sent to the patient and her physician. Every reasonable effort is made to persuade the patient to consult her physician if there is evidence that she needs or would benefit from his guidance and advice. The physician is invited and encouraged to avail himself of our facilities and resources in

the management of the problem, whatever it may be.

More than 30 percent of the participants show substantial indications which warrant a recommendation of treatment by the family physician.

The program is a continuing one. An effort is made to return a team to each plant once every 18 months on a revolving schedule. But when urgency is indicated, teams return to visit some patients at 3-month intervals or less.

### **Achievements**

Initially the membership served in the vicinity of Harrisburg numbered 1,800. Today, 4 teams, or 8 persons, serve about 6,000 members in an area which has been expanded to include the vicinity of Johnstown.

Facilities now available in Harrisburg permit a member to receive, free of cost, a complete physical examination if it is needed or requested. And a variety of social services are given from time to time.

Member participation in the survey has increased to more than 80 percent.

In 13 years of operation in 16 counties of Pennsylvania more than 1,300 physicians whose patients participate in the survey have never protested or objected to the programs, but rather, there have been many expressions of appreciation and approval. Every physician is treated with tact and consideration, his relationship with his patient is carefully protected, and every effort is made to preserve his professional prerogatives.

Employers have not only accepted the survey but express their satisfaction emphatically by a well-nigh universal participation.

### **Cooperative Medical Services**

**brief** Between 1926 and 1954, the national industrial accident frequency was reduced 75 percent. Since 99 percent of all employers in 1957 had fewer than 500 employees, this rate reduction presumably occurred primarily in small plants.

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*Based on a paper by W. W. Dickinson, M.D., medical director, Hartford Small Plant Medical Service, Hartford, Conn.*

hensive medical service, and there was no thought of replacing the family physician or existing medical facilities. But it would have been unrealistic not to acknowledge that demands for medical services far exceeded the supply of doctors. The proposed plan offered reinforcements to help the doctor do the job confronting him in the community.

A complete and continuing diagnostic survey would require a team composed of a full-time physician, a nurse, possibly a medical secretary to assist with paperwork, and a laboratory technician to perform basic routine studies. It was recognized that the cost of such a survey would be prohibitive. Yet if the plan were to be principally diagnostic in aim, with the objective of assisting and supplementing the work of the family doctor, what service could be given that would be meaningful within the fiscal limitations of the union's resources?

It was decided that a carefully recorded medical history, taken in conjunction with routine laboratory studies, might yield an impressive number of actual, latent, or potential abnormalities. This conviction supplied the basis for the *modus operandi* of the mobile health survey program.

### Operating Methods

Supervisory responsibility for the survey is centralized at the district headquarters level of the union, the district medical director controlling the survey program, as he does other medical activities. Home base for the survey teams is in quarters adjacent to the office of the medical director. Each team is composed of two young women, one a medical caseworker and the other a well-trained clinical laboratory technician. To facilitate followup, when employment at the survey site is large, more than one team is used in order to shorten the time interval between visits. The importance of early detection of abnormal conditions needs no elaboration.

The medical department is supported by the staff of the union's district headquarters. Preliminary promotional efforts, liaison duties, and administrative functions are accomplished with their assistance.

In consultation with the local manager of the

union, a schedule of survey visits is arranged. Before the survey begins, the workers at a plant on the schedule are approached as a group at their place of employment. The survey routine is described in detail, the benefits to be derived are explained, and all prospective participants are assured that information obtained as a result of the survey is treated with the utmost confidence. It is stressed that no one has access to the records except the medical director and the employee's own family physician. Participation in the survey is voluntary; there is no coercion, and no pressure, in any form, is brought to bear.

Space is supplied by the employer. Elaborate arrangements are not necessary but one condition is fixed and unvarying—there must be absolute privacy for the employee and the medical caseworker while the employee's history is recorded.

Certain laboratory procedures are routine. The technician does a complete urinalysis (physical, chemical, and microscopic), a blood study which includes hematocrit, hemoglobin, leucocyte, and differential counts, and finally a blood type and Rh factor finding.

When other studies are indicated, they are accomplished. If the leucocyte count is elevated, if history reveals suggestive or presumptive evidence of arthritis, lung pathology, or any acute or chronic malady, a sedimentation test is done. If the hemoglobin or hematocrit is impressively increased or depressed, an erythrocyte count is made. Should the urinalysis disclose glycosuria, or should there be a family history of diabetes, a blood sugar determination is made. Blood sugar tests are made if the patient is overweight and hypertensive, if there is history of excessive water consumption, frequent abscesses, or any similar indication. And if we lack the facilities for any study that seems advisable, arrangements are made to have the study done elsewhere.

Survey teams are not staffed by graduates in medicine. But the medical caseworker has completed a course of training, and has the appropriate personality, poise, and interest in medicine to qualify as a case historian. The professional requirements of a laboratory technician are well known.

We are convinced that presumptive evidence

adding an hour for each additional 100 employees.

Ideally, factories should not be separated by more than 3 to 5 miles, to avoid travel time loss, unnecessary expense, and delay in response to emergency demands.

Dispensaries vary in size from 600 to 1,200 square feet. The preferred size, as determined by allotting 3 square feet for each employee, provides adequate space for treatment and recovery rooms, laboratory, and consultation.

The medical director performs about 176 physical examinations per plant each year. And during 1958, I held 2,300 consultations with employees. Preventive medicine is emphasized and influenza and Salk vaccine injections are given.

Tensions and financial limitations cause many employees to avoid visits to their family doctor for what they consider minor symptoms. In the interest of early treatment and keeping the working force healthy, which is after all our main objective, we welcome consultations and visits to the dispensary. Although no treatment is given for conditions unrelated to employment, we do examine employees, help temporarily with a minor illness such as a head cold, and, if investigation and further treatment are indicated, we urge the employee to visit his doctor. Attending physicians are welcoming our services more and more, leaving the return-to-work status entirely within our judgment.

Management should evaluate more carefully the nurse's contribution to industry. I call the eight on duty at our dispensaries the "jewels of our service." Their patience, understanding, and professional, administrative, and counseling abilities act as a buffer between labor and management. Litigation is prevented time and time again through a nurse's arbitration, and frustrated, upset, and injured employees find their neuroses nipped in the bud by her practical and interested counsel. Industrial nurses are registered specialists, and a medical service program must rely on their abilities for much of its successful operation.

The national accident level in 1958, according to the U.S. Department of Labor, was 4 percent less than in 1957 and the lowest in 20 years. Connecticut's accident level decreased 14.2 per-

cent. But even with this improvement, 881,000 man-days were lost in Connecticut during 1958, at a cost of almost \$97 million.

Our experience shows that medical service similar to the Hartford plan, at an average cost of \$20 annually per employee, can result in decreases of 50 percent in absenteeism, 60 percent in labor turnover, 75 percent in lost-time accident rates, and 60 to 90 percent in the accident frequency and severity rates.

## Visiting Industrial Nurses

**brief** Part-time hourly industrial nursing service meets a community need in Philadelphia, where experience has shown that sound public health nursing principles can be applied by provision of in-plant services to selected small industries.

The Visiting Nurse Society of Philadelphia first offered hourly nursing service to small plants in 1932, as a demonstration project in cooperation with the Metropolitan Life Insurance Company and the Philadelphia Tuberculosis Association. After 8 years, the insurance company and the association felt that the program had proved itself and withdrew. The Visiting Nurse Society has continued the program, serving from two to eight plants. At present, we are serving four.

A physician certified in industrial medicine is a member of the society's medical advisory committee and each plant served is required to employ a physician to give medical direction and assume responsibility for health services.

Visits to the plant are on a scheduled basis, the doctor at least once a week, and the nurse according to predetermined plant needs. Experience has shown that an appropriate minimum nursing service per day is 2 hours; the maximum continuous nursing service is 4 hours daily. One hour is not sufficient for adequate service and proper identification with plant personnel. And we have found that plants re-

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*Based on a paper by Bernice Krakow, R.N., occupational health consultant, Visiting Nurse Society of Philadelphia, and instructor in occupational nursing, Woman's Medical College of Pennsylvania, Philadelphia, Pa.*



During this period, medical services were being established and preventive medicine was being applied to industry.

As 30 years of such experience records, I find it difficult to understand the apathy of a management which has never endeavored to establish a medical department and has no interest in absenteeism rates, labor turnover, and compensation and accident-sickness costs. In talking with some of these employers, I have found that they did not know that medical service could reduce such losses by 50 to 60 percent.

There are many ways to approach the problem of supplying medical services to employees in a small plant. The main stumbling block to setting up a medical department in these plants seems to be space for a dispensary and the annual salary of a full-time registered nurse at a minimum of \$4,000.

One solution is the employment of a full-time physician on a salary basis by a group of companies in a community. Each firm supplies its own medical quarters and nursing staff. Well-known examples of this arrangement are the East Liverpool (Ohio) District Potteries Industrial Medical Service and the Hartford (Conn.) Small Plant Group Medical Service. Another such group, instituted in December 1955, is the New Haven Small Plant Medical Program.

In Winder, Ga., six firms support the Manufacturers Health Clinic. The clinic was established in a central location for the use of six companies, with a nurse in charge. The nurse visits first-aid facilities at the industrial sites. Doctors in the county are called upon to serve the patients when necessary.

Several New York office buildings have central clinics for tenants who may wish to provide medical service to their employees.

In Asheville, N.C., the Occupational Health Center is operated by a physician and serves several small companies. A mobile trailer is used by this clinic's staff for periodic physical examinations, X-rays, and laboratory tests.

Proprietors of small business establishments who are interested in medical services for their employees may find it useful to refer to the 1959 report on "Company Medical and Health Programs" prepared by the National Industrial

Conference Board, Inc., 460 Park Avenue, New York 22, N.Y. A complete discussion of the various types of programs for medical services, together with details of operation and policy, is found in this document.

### Hartford's Plan

In Hartford, our program is a cooperative effort which permits neighboring companies to share expenses. The Hartford Small Plant Medical Service was formed in 1946. Six firms, employing about 3,000 employees, were represented in the original group which met to consider how they could administer jointly a comprehensive medical program which they individually could not afford. Three of the original firms still belong to the service; four other firms have been added.

The idea of a central clinic was discarded as impractical because the cost of staffing and equipment was excessive, it could not give fast and convenient service to all members, and employees would lose too much time from production in travel. The final plan, which was the result of voluntary cooperation by local physicians, the Connecticut Medical Society, the State bureau of industrial hygiene, and the Manufacturers Association of Connecticut, called for individual dispensaries, equipped and staffed by a registered full-time nurse at each plant and a full-time physician rotating among the plants, giving professional supervision to each nurse and the benefit of his professional knowledge to each company group. The physician is called the medical director and reports to the personnel officer of each company. The nurses are responsible to each management as employees with full benefits, although their activities are supervised by the medical director. Coordination is achieved through regular meetings of the nurses with the medical director and the medical director with the personnel officers.

The medical director is retained by each company on an annual contract basis, payment being made at an hourly rate according to the predetermined needs of each plant. The minimum amount of time allotted to each company is 4 hours weekly. It is my belief that 2 hours a week is necessary for the first 100 employees,

nurse, as a part of the Visiting Nurse Society, can encourage the participation of small plants in tuberculosis, glaucoma, diabetes, and other surveys; arrange film showings, lectures, and demonstrations, depending on need and reception; and call on the society's resources for consultation with specialists, such as the nutritionist, to help plan for weight-reduction classes for obese employees.

The nurse is a member of the safety committee of the plant and frequently interprets health and safety hazards to management.

### Problems

There is difficulty in promoting use of part-time industrial nursing services by small plants in the community. This may be due to lack of understanding, professional restrictions to many promotional techniques, its cost to the plants since benefits of the service are essentially intangible, changing economic patterns, or lack of funds in the society for promotion of this service.

Within the Visiting Nurse Society itself, staff turnover makes it difficult and costly to train nurses for industrial service and to give continuity of service to small plants. Historically, the society sees itself in the role of a source of bedside care to the sick. The orientation and education of supervisory personnel in the importance of the industrial service in relationship to total service merits special and separate planning. Supervisory support is essential to staff morale and quality of care in the plants. Rising costs of all services produce concern for the society's ability to continue to supply industrial service.

Experience has shown that the society's insistence on medical direction has been a factor in management's lack of interest in purchasing the service. Also, many physicians who give part-time service to plants are not interested or trained in occupational health. This results in inadequate program, irregular service, and lack of interest in plant personnel. In the end, man-

agement feels it is not getting enough for its investment.

### Gains

We believe, however, that the value of the program outweighs its difficulties. In a small way, we impress the community with the importance of occupational health services to employees of small plants. These people should have the same health advantages as employees of large business establishments. Between 1950 and 1958 inclusive, 14,750 employees of 8 small plants in the Philadelphia area received 75,606 visits from our part-time industrial nurses. These employees represent a group which otherwise would probably not have had the benefit of such services.

Nurse training in the occupational setting adds background and understanding which help the staff in general service. Few diploma or degree programs offer occupational health nursing courses and the average nurse entering industrial nursing learns by experience. We are in a position to offer better service to the industrial community since our public health nurses are specially trained and carefully supervised.

Industrial service encourages interest in occupational health, particularly through the field observation opportunities given to selected university students.

Our records show only three reasons for termination of the Visiting Nurse Society's industrial nursing service after it has been instituted. They are economic reverses at the plant, relocation of the industry to an area outside the society's scope, or employment of a full-time nurse.

We are most gratified when a full-time nurse is employed, because to us it means that we have met our long-range goal. We have demonstrated the program and proved its value. As a result, management has assumed full responsibility, leaving the society free to promote new service in another plant.

questing more than 4 hours daily nursing service usually need full-time coverage.

A simple contract is executed between plant management and the society, which specifies the amount and kind of nursing service to be given, the hourly cost, and a termination clause. The contract is renewed annually.

The hourly charge for nursing service is based on salaries, vacation, sick leave, transportation, and other overhead costs such as workmen's compensation, social security, pensions, and the like. At present the charge is on a sliding scale: \$4.50 the first hour, \$4.25 the second hour, and \$4 for each subsequent hour. These figures were computed from cost analysis findings.

### **Selection and Inservice Training**

Aside from the improved quality of industrial nursing performance, we have found that any public health nurse oriented in occupational health has a broader basis for understanding the problems of her patients than nurses without such orientation. One of our long-range and admittedly idealistic goals is to expose all of our staff to this program.

Our visiting industrial nurses are selected on the basis of their interest in occupational health, an evaluation of field service performance in public health, and consideration of individual potential. The nurses selected are offered inservice orientation classes in a series varying from 16 to 20 hours. Basic concepts of industrial nursing are discussed, problems are outlined, and functions and responsibilities are defined. An attempt is made to permit class participants an opportunity to observe health services in industry through visits to a plant served by the VNS, to a large plant with full-time nursing service, and to a labor health center.

Nurses are assigned to a plant as one aspect of their general fieldwork. Their first plant assignment is usually as an alternate or relief nurse. As newcomers, they learn much from the periodic group meetings of the occupational health nursing staff at which mutual problems are discussed and program changes and information on current trends are also on the agenda.

To encourage further inservice training, the

society is a member of the National Safety Council, subscribes to appropriate periodicals, and arranges for representative attendance at community meetings, conventions, and lectures. For the past 3 years, the Woman's Medical College of Pennsylvania has offered a certificated course of seven sessions in occupational health nursing, and selected nurses are given the opportunity to attend these sessions.

Within the society, the occupational health consultant is responsible for the promotion, programing, training, and supervision of nurses in industry.

### **Services**

The services the public health nurse offers industry and the degree to which she uses her training depend on the attitude and interest of the medical director of the plant and the support given by management. We have seen progress over the years, however, from a first-aid dispensary for treatment of lacerations to full recognition of all health services.

The responsibilities of the visiting industrial nurse, as we see them, are concerned with first aid, physical examination, followthrough, health education and counseling, and safety.

Although the nurse assumes responsibility for first-aid treatment when an accident or illness occurs while she is on duty at the plant, a major contribution in part-time service is the instruction of the first-aid team, arrangements for care in the nurse's absence, an emergency referral system, and careful followthrough.

The nurse assists in the technical details of a physical examination and takes the patient's health history.

Since the public health nurse brings to industry experience in working with family health problems and a knowledge of community resources, she is in a unique position to encourage and follow up on employee compliance with recommendations of the medical director, the family doctor, and the tenets of good health practice.

Public health education of employees on an individual or general program basis in a plant setting can be a part of the nurse's responsibility, in view of her knowledge and background in field service. Also, the part-time industrial

# The Peeling House Paint Hazard to Children

EVELYN E. HARTMAN, M.D., WILFORD E. PARK, M.D., and H. GODFREY NELSON, B.S.

THE occurrence of lead poisoning among small children living in poorly maintained homes in some centers of population in parts of the United States has been well established (1-4). Studies on urinary lead levels in the absence of symptoms of lead poisoning have been mentioned less frequently in the literature. This study was undertaken to determine whether or not abnormally high urinary lead levels might be found among Minneapolis children even in the absence of lead poisoning symptoms.

While no deaths from lead poisoning among small children have been reported to the Minneapolis Health Department for several years, and no diagnosed cases have been referred to the health department for followup, it was felt that there was enough uncertainty to warrant a study of urinary lead levels among small children attending well-child clinics.

## Screening in Clinics

The children chosen for the study were those attending the well-child clinic at the Minneapolis Public Health Center, which is operated four times per week, with an average caseload of 17 per session. The clinic was chosen chiefly because the participating children come from all parts of the city rather than from any one

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*The authors are all with the Minneapolis Health Department, where Dr. Hartman is director of the bureau of maternal and child health, Dr. Park, chief of the occupational health service, and Mr. Nelson, public health chemist.*

area. This clinic has an additional advantage in that it is in the same building as the city public health laboratory. Financial eligibility standards restrict the families attending to those in the lower middle and low income brackets. Clinic service is available to children from birth until they enter school at 5 years of age.

Spot samples of urine were collected while the children were attending the well-child clinic. Very few urine samples were obtained from children under 2 years of age. If the child was unable to void, no further attempt was made to obtain a sample until the child again visited the clinic in his regular appointment schedule. Eliminated from the study were samples with an insufficient quantity of urine.

The urine samples were obtained through the use of a potty chair with a special laboratory tested leadfree vessel and were transferred immediately to a labeled, leadfree, Pyrex flask, with a large mouth and covered by an overlapping rubber cap. Urine specimens were kept in a refrigerator until picked up by the chemist.

Lead analyses were made in the Minneapolis Public Health Laboratory by Godfrey Nelson, using the modified dithizone method that has been used by the Minnesota Department of Health Laboratories since 1951. Preliminary work was done during the summer of 1958 by this worker in familiarizing himself with the laboratory technique. The urine specimens were also tested for albumen and sugar and for evidence of phenylketonuria. The results of these tests will not be reported in this paper.

# Signs

and

# Symptoms

## *of trends in public health*

Increases in drownings and water accidents caused the Greater Cleveland Safety Council to start a water safety campaign in 1955. Meetings and consultations with boating enthusiasts and commercial and civic groups resulted in the formulation and adoption of a city ordinance establishing firm rules and providing for the prosecution of reckless boat operators by stiff fines and even jail sentences. A community education program, supported by many of the local and national organizations concerned, publicized the new ordinance.

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Every county in Virginia now has at least one practicing physician as a result of an intensified scholarship and placement program. Fifteen years ago, 6 Virginia counties were without a physician, and in 12 counties there was only one physician for every 15,000 residents.

A State program awards scholarships to medical students who pledge 1 year of practice in a rural area or in a mental or tuberculosis hospital. About 250 physicians have been placed since 1951.

« »

Water resources in Rensselaer County, N.Y., are revealed in a progress report published recently by the county health department. The housing composition, different types of water usage, known domestic and municipal water supply needs, and the value of an adequate supply of satisfactory water are discussed, and a population study is described.

This is the first of a series of environmental health studies planned by the department.

A new and growing development in prepaid dental care is the establishment of dental service corporations by State dental societies. In January the American Dental Association counted 10 constituent dental societies with such service corporations organized. Four were operating in California, Oregon, Washington, and Rhode Island.

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Pennsylvania has enacted a new law (act 302) governing burial of radioactive wastes which Governor David L. Lawrence calls "a major forward step in protecting the public against possible atomic age hazards." The new law establishes legal requirements for burial of "hot" radioactive wastes, a permit system for applicants, rules and regulations for burial, and penalties for violators.

« »

Careless eating habits or too much sugar are more likely to be the main causes of ulcers than strain, stress, or excessive responsibility. Dr. Charles Pulvertaft, radiologist to city and county hospitals in York, England, reported after a survey of more than 2,600 ulcer patients in urban and rural York areas, conducted by the York Peptic Ulcer Research Trust.

In general, he said, there were fewer ulcers among top-ranking businessmen than among lower paid people doing routine and often unimportant jobs. Shift workers were cited as being particularly ulcer prone. But worst of all, according to the survey, are people who go without food for more than 5 hours in the afternoon or eat only sandwiches.

Speeding in an ambulance has been condemned by a joint medical-safety committee of the American College of Surgeons, the American Association for the Surgery of Trauma, and the National Safety Council after a survey of 865 cities on emergency care for the injured.

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Doctors in Boulder County, Colo., in the course of a 1959 State health department drive to encourage immunization against poliomyelitis, gave 20,472 injections in two 3-day campaigns within 1 month.

Population of the county is approximately 70,000, and only 3 cases of poliomyelitis were reported in 1957, none in 1958, and none in 1959. One-third of the injections were first shots and about 60 percent of the respondents were adults more than 19 years of age.

The State health department purchased the vaccine, guaranteed an adequate supply, and sold it to physicians at cost.

Injections were made available in all doctors' offices at reduced rates of \$5 for the entire family or \$2 per injection if the family consisted of fewer than three persons. At the same reduced rates, hospital clinics, staffed by volunteers, participated on Saturday night during each campaign.

A review of Boulder County's campaign appears in the March 1960 issue of the *Rocky Mountain Medical Journal*.

« »

Although most teenagers don't believe they are the Nation's poorest drivers, a comprehensive "accident involvement" survey conducted by the Bureau of Public Roads found that "Drivers under 20 years of age had the highest rates and were involved in accidents at a rate in excess of two and one-half times that of all drivers." A Purdue University opinion panel poll found that fewer than half of 11,000 young people checked knew that they constitute the age group with the worst driving record.

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Mental health practice by public health nurses is discussed in the May 1960 issue of *Nursing Outlook*.

**Table 2. Findings of initial and final analyses of urine in cases with high urinary lead, Minneapolis**

Case No. and patient	Urinary lead levels				Final examination <sup>1</sup>			
	Date	Mg./liter	Date	Mg./liter	Date	Urine lead mg./liter	Hb. gm./100 cc.	Symptoms and medical findings
1. MS-----	4/22/59	0.17	5/4/59	0.18	10/28/59	0.04	12.0	None.
2. BD-----	5/13/59	.14	6/22/59	.14	7/8/59	.14	-----	None.
3. RT-----	7/1/59	.21	8/10/59	.12				
4. GT-----	7/1/59	.13	8/10/59	.09				
5. MT-----	7/1/59	.18	8/10/59	.07				
6. GG-----	7/6/59	.09	8/10/59	.16	10/16/59	-----	12.0	None.
7. LR-----	7/6/59	.12						
8. RSp-----	7/13/59	.11	8/10/59	.20	10/22/59	.06	12.0	None.
9. RSw-----	7/13/59	.16	8/10/59	.08	10/22/59	.04	11.5	Poor appetite, vomiting, pica, earache, red drum.
10. DJ-----	7/14/59	.14	8/10/59	.08	10/22/59	.04	13.5	None.
11. KL-----	7/15/59	.10	9/4/59	.10	10/22/59	.11	12.0	Pica.
12. CR-----	7/22/59	.16	8/11/59	.17	10/1/59	.06	9.0	Pica, dietary deficiencies (hospitalized).
13. JM-----	8/10/59	.30	8/12/59	.28	10/29/59	.03	12.5	None.
14. MA-----	8/28/59	.13	-----	-----	10/22/59	.09	13.0	None.
15. VS-----	9/11/59	.12	9/21/59	.07	10/22/59	.07	12.0	Pica.
16. HH-----	9/21/59	.12	-----	-----	10/22/59	.05	11.0	Pica.

<sup>1</sup> In the final examination, none of the specimens showed stipple cells.

age battery manufacturing plant. One of the children played with the workshoes of one of the men. Paint cans were also found stored in the bathroom shared by both families. Analysis, however, showed the paint to be low in lead (0.6 percent). No loose paint was found on the multiple-dwelling house.

In the other five cases with high lead levels, no source of lead was found inside the homes. In each case, however, paint was peeling off the exterior of the houses. Upon questioning, it was found that the children usually played in areas immediately adjacent to the houses. There was no vegetation in these play areas, and particles of dried paint were mixed with the dirt. Analysis of this dried paint showed a lead content ranging from 12 to 42 percent, with an average of 24 percent.

Urine was not obtained from the preschool sibling of case 1. In the other cases, there were no siblings in the age range of 2 to 5 years.

#### Children in Selected Homes

Since the first two cases found in the clinic screening were believed to be related to chipping outside house paint and since the housing section of the Minneapolis Health Department was also interested in the health significance

of chipping paint from the standpoint of housing maintenance, the study was expanded to include samples of urine obtained from small children who were known to be living in houses with exterior paint obviously peeling.

About July 1, 1959, a search began for such houses. Some were brought to our attention by the housing section. Others were spotted by Dr. Park while driving around the city on other health department business. When a house with badly peeling paint was surrounded by well-trodden ground close by, the occupants were asked whether or not the residents included children between the ages of 1½ and 5 years. If there were children of these ages, the visitor identified himself and the purpose of the study was explained. The mother was told that the health department wanted to determine whether or not the falling paint was creating a health hazard. Spot urine samples in leadfree flasks were obtained from the small children, and a sample of the falling paint was collected for lead analysis. At the same visit, the parent was urged to keep the children from putting the chipped paint in their mouths.

In the study of 14 homes with badly chipped or peeling paint on the exterior where there was evidence that the children played close to the house, analysis of the various paints showed

The study began on August 25, 1958, and was terminated on October 10, 1959.

Between August 25, 1958, and April 30, 1959, a total of 199 specimens of urine from children attending the well-child clinic were examined (table 1). Only one of these urine samples contained more than 0.08 mg. of lead per liter, which is considered the high point within the normal range. This high urinary lead was found on April 22, 1959 (tables 1 and 2).

Between May 1 and October 10, 1959, when the study was discontinued, 194 more urine samples were examined in the well-child screening program and 6 more were found to have high lead content. The high urinary lead cases found through the well-child clinic are cases 1, 2, 10, 11, 12, 15, and 16 in table 2. In these, the lead levels ranged from 0.10 mg. to 17 mg. per liter.

A home survey was made to determine the source of lead in all seven of the high lead cases found among the well-child clinic children. In each case a search was made for the usual sources of lead within the home, such as evidence of paint chewed off toys and cribs, chip-

**Table 1. Findings of lead analysis of urine specimens from the well-child clinic of the Minneapolis Public Health Center during the period August 25, 1958–October 10, 1959, by month**

Month	0.08 mg. per liter or less	More than 0.08 mg. per liter	Total tested
<i>1958</i>			
August.....	9	0	9
September.....	21	0	21
October.....	14	0	14
November.....	8	0	8
December.....	25	0	25
<i>1959</i>			
January.....	34	0	34
February.....	28	0	28
March.....	33	0	33
April.....	26	1	27
May.....	33	1	34
June.....	40	0	40
July.....	38	3	41
August.....	48	0	48
September.....	23	2	25
October.....	6	0	6
Total.....	386	7	393

## Prevention of Lead Paint Poisoning in Baltimore

Activities aimed at protecting teething children from lead paint poisoning in Baltimore, started in 1931 by the city's health department, were expanded in December 1959. At that time, inspection teams of workers from the city health department and housing agency visited the homes of children of about a year old who attend the well-baby clinic of the Druid Health District, an area with a history of many lead poisoning cases among children. Parents are informed of the lead paint danger and samples are taken for analysis. Any paint containing lead is ordered removed.

Following initial coverage of about 250 homes, the schedule calls for testing 15 homes a week on a continuing basis.

In the first home visited after the project's inauguration, 16 out of 26 paint samples tested positive for lead. The visit also pointed up mass health education needs: an apartment in the building was being painted gaily for Christmas from cans clearly labeled as containing lead and not for use in interiors. Health authorities recognize the need for community cooperation from paint manufacturers, who must supply a wide selection of leadfree paints to mothers who will need to exert fullest vigilance over their small children's activities.—*From Baltimore Health News, February 1960.*

ping wall and floor paint, lead water pipes, and burning of storage battery cases. In several instances samples of tapwater were analyzed and found to be free of lead. While inside maintenance and housekeeping frequently left much to be desired, no obvious sources of lead within the homes were found except in cases 15 and 16. Inquiry was made as to peia, and was admitted in cases 11, 12, 15, and 16. The children in cases 11, 15, and 16 ate dirt while playing outdoors. The child in case 12 had been eating plaster, but an analysis of the plaster revealed no lead.

Followup on cases 15 and 16 showed the lead source to be lead dust brought home on the clothing of two men living in the multiple dwelling which housed the families of both children. Both men worked in the same stor-

**Table 2. Findings of initial and final analyses of urine in cases with high urinary lead, Minneapolis**

Case No. and patient	Urinary lead levels				Final examination <sup>1</sup>			
	Date	Mg./liter	Date	Mg./liter	Date	Urine lead mg./liter	Hb. gm./100 cc.	Symptoms and medical findings
1. MS-----	4/22/59	0.17	5/4/59	0.18	10/28/59	0.04	12.0	None.
2. BD-----	5/13/59	.14	6/22/59	.14	7/8/59	.14	-----	None.
3. RT-----	7/1/59	.21	8/10/59	.12				
4. GT-----	7/1/59	.13	8/10/59	.09				
5. MT-----	7/1/59	.18	8/10/59	.07				
6. GG-----	7/6/59	.09	8/10/59	.16	10/16/59	-----	12.0	None.
7. LR-----	7/6/59	.12						
8. RSp-----	7/13/59	.11	8/10/59	.20	10/22/59	.06	12.0	None.
9. RSw-----	7/13/59	.16	8/10/59	.08	10/22/59	.04	11.5	Poor appetite, vomiting, pica, earache, red drum.
10. DJ-----	7/14/59	.14	8/10/59	.08	10/22/59	.04	13.5	None.
11. KL-----	7/15/59	.10	9/4/59	.10	10/22/59	.11	12.0	Pica.
12. CR-----	7/22/59	.16	8/11/59	.17	10/1/59	.06	9.0	Pica, dietary deficiencies (hospitalized).
13. JM-----	8/10/59	.30	8/12/59	.28	10/29/59	.03	12.5	None.
14. MA-----	8/28/59	.13	-----	-----	10/22/59	.09	13.0	None.
15. VS-----	9/11/59	.12	9/21/59	.07	10/22/59	.07	12.0	Pica.
16. HH-----	9/21/59	.12	-----	-----	10/22/59	.05	11.0	Pica.

<sup>1</sup> In the final examination, none of the specimens showed stipple cells.

age battery manufacturing plant. One of the children played with the workshoes of one of the men. Paint cans were also found stored in the bathroom shared by both families. Analysis, however, showed the paint to be low in lead (0.6 percent). No loose paint was found on the multiple-dwelling house.

In the other five cases with high lead levels, no source of lead was found inside the homes. In each case, however, paint was peeling off the exterior of the houses. Upon questioning, it was found that the children usually played in areas immediately adjacent to the houses. There was no vegetation in these play areas, and particles of dried paint were mixed with the dirt. Analysis of this dried paint showed a lead content ranging from 12 to 42 percent, with an average of 24 percent.

Urine was not obtained from the preschool sibling of case 1. In the other cases, there were no siblings in the age range of 2 to 5 years.

#### Children in Selected Homes

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of chipping paint from the standpoint of housing maintenance, the study was expanded to include samples of urine obtained from small children who were known to be living in houses with exterior paint obviously peeling.

About July 1, 1959, a search began for such houses. Some were brought to our attention by the housing section. Others were spotted by Dr. Park while driving around the city on other health department business. When a house with badly peeling paint was surrounded by well-trodden ground close by, the occupants were asked whether or not the residents included children between the ages of 1½ and 5 years. If there were children of these ages, the visitor identified himself and the purpose of the study was explained. The mother was told that the health department wanted to determine whether or not the falling paint was creating a health hazard. Spot urine samples in leadfree flasks were obtained from the small children, and a sample of the falling paint was collected for lead analysis. At the same visit, the parent was urged to keep the children from putting the chipped paint in their mouths.

In the study of 14 homes with badly chipped or peeling paint on the exterior where there was evidence that the children played close to the house, analysis of the various paints showed



a high lead content, usually between 15 and 30 percent. Urine was obtained and analyzed from 24 of the young children living in these homes. Of the 24 children, 9 were found to have abnormally high lead levels in their urine samples (table 3). In only one house was more than one child found with high urinary lead content. In this home, three children aged 2, 3, and 4 years had lead in the urine measuring 0.18, 0.13, and 0.21 mg. per liter, respectively. These cases are 5, 4, and 3 in table 2. In none of the houses where a child was found to have high urinary lead were sources of lead observed other than the peeling exterior house paint. In this part of the study, only case 9 had a history of pica, according to the parents.

### Findings From Poorly Maintained Homes

By combining the 5 cases of high urinary lead related to peeling exterior house paint, found through the well-child clinics, with those found in selected homes, a total of 14 children with high urinary lead levels was obtained. These were found among small children living in 19 homes with badly peeling paint wherein no other source of lead was found. The urinary lead levels in these 14 cases ranged from 0.09 to 0.30 mg. per liter (table 2, patients 1 through 14).

Twelve of the fourteen children provided urine specimens again about a month later. At this time the lead levels in the urine of five of the children were essentially the same as before, two had significantly higher urinary lead than

previously, two had lower, and in three children, the urinary lead had fallen to normal level.

Three of the children (cases 3, 4, and 5) whose second urinary lead tests were either normal or distinctly lower than formerly, lived in the one house which was painted during the study. The painting was done at about the time the first urine specimens were obtained and further falling of paint thereby prevented.

### Followup

During the month of October 1959, an attempt was made to give a final check to each of the 16 children who had high urinary lead levels. One child, case 12, with a hemoglobin of 9 grams had previously been referred to the Minneapolis General Hospital for more extensive studies because of marked pica and dietary deficiencies. The high urinary lead was verified by the hospital, and, although there were no physical findings nor symptoms warranting a diagnosis of lead poisoning, a 5-day course of ethylenediamine tetraacetic acid was considered justified. On the fourth day of the EDTA treatment, the urinary lead was 0.54 mg. per liter, and the blood level 0.04 mg. percent. At completion of the treatment, the urinary lead was found to be a normal 0.06 mg. per liter.

The remaining 15 children were asked to report to the well-child clinic for a physical examination by Dr. Hartman. Ten of the fifteen did report and, at that time, urine specimens were obtained from nine of them for lead analysis. Blood was obtained from all 10 for hemoglobin estimations and stipple cell counts. In seven of the nine urine specimens examined at this time, the lead levels were normal, and in the other two, readings of 0.09 and 0.11 mg. of lead per liter were obtained (table 2). None of the children had any stippling of red blood cells. The hemoglobin levels ranged from 11.0 to 13.5 grams per 100 cc. None of the children had exhibited any signs or symptoms pointing toward a diagnosis of lead poisoning, and this includes cases 3, 4, 5, and 7, who were seen by Dr. Park at the time the first urine specimens were collected. Cases 9, 11, 12, 15, and 16 had a history of pica. Parents were again warned about the hazards of children putting dirt in their mouths.

**Table 3. Findings of lead analysis of urine specimens from children living in selected houses with peeling paint in Minneapolis, by month, 1959**

Month (1959)	Number of houses	Urine specimens		
		Number with lead 0.08 mg./ liter or less	Number with lead more than 0.08 mg./ liter	Total num- ber tested
July-----	11	12	7	19
August-----	2	1	2	3
September----	1	2	0	2
Total----	14	15	9	24

## Discussion

We recognize that the use of spot samples of urine for lead analysis has limitations and may be open to question. Sometimes a case of lead absorption may be missed when only one sample is obtained. On the other hand, high urinary lead, when found in a spot sample, is an indication of excessive lead absorption. In this study, blood test lead was not determined because the children had no symptoms of lead poisoning, and there seemed to be no necessity to attempt to establish a diagnosis of lead poisoning.

The occupational health service of the Minneapolis Department of Public Health, under the direction of Dr. Park, has for several years been collecting and analyzing spot samples of urine to measure industrial exposures to lead. In this work it was found that spot urine samples are a reliable indication of the degree of lead absorption, if the following conditions are met: the urine samples are collected on separate days, the specimens are not contaminated with extraneous lead, and two or more specimens are in close agreement on lead content (5).

A similar experience, with spot urine testing for lead, was reported through personal communication by W. G. Frederick, of the bureau of industrial hygiene of the city of Detroit, in October 1956.

The possibility of contamination during collection of spot samples of urine, by the methods used in this study, may raise some doubt as to the validity of the results. We have found instances of contamination in industrial surveys, but the lead content in the urine in these cases has always been so excessive that contamination was immediately detected (5).

There is reason to believe that lead hazards inside of homes in our city are minimal, since a fair sampling of urine specimens (386) from children attending the well-child clinic were found to be normal in lead content. The children came from homes from all parts of the city from the lower middle and low socioeconomic groups. In the seven cases with elevated urinary lead levels among well-child clinic patients the lead source was traced to factors other than those within the homes.

Except for cases 15 and 16 the cases found through the well-child clinic were caused by

chipping exterior house paint. Although the parents gave a history of pica in only two of these five children, it has been noted that mouth-ing of materials is an almost universal habit of young children, exclusive of pica (3,6). We therefore believe that the elevated urinary lead was caused by ingestion of the peeling house paint which was mixed in the dirt in which the children played.

All of the five cases were found in the spring and summer months of 1959 from among 199 specimens collected during the last week of August 1958 and April through August 1959 as compared with 2 abnormal lead levels among 194 urine specimens collected at other times of the year. These two cases were not caused by chipping outside house paint. This seems to support the suggestion of Baetjer (4) that children may have more opportunity to ingest exterior paints in the summer. Our study of elevated urinary lead even in the absence of symptoms of lead poisoning seems to parallel the seasonal incidence of lead poisoning found in Baltimore (4) and Boston (3).

If we take only those small children who are known to be exposed, that is, if we start with those in the selected homes as we did in the second part of this study, we get a very high proportion with high urinary lead (table 3). Of 24 children exposed to these conditions in 14 such houses, high urinary lead was found in 9. If we include the five children with high urinary lead levels who were found through the well-child clinics and who lived in the 5 separate houses in similar condition (cases 1, 2, 10, 11, and 12 in table 2), we get a total of 19 homes with peeling outside paint. In these 19 homes, urine specimens were obtained from 29 small children, of which 14 had high urinary lead content. This amounts to 48.3 percent of the urines examined and is comparable to the 44.4 percent found in Baltimore some years ago, when a more extensive study was made using specimens of blood instead of urine for the lead analyses (2,7).

In terms of the buildings themselves in relation to the number of small children with high urinary leads, we find that 19 peeling houses gave us 14 children with high urinary lead. This in terms of probability means that for every 100 such houses, with small children

living in them, there are likely to be 74 children eating enough of the falling lead paint to raise their urinary lead level above normal during the summer months. While not many will eat enough paint, over a long enough period, to cause manifest lead poisoning, this is a lead hazard which housing authorities and the Minneapolis Health Department cannot afford to ignore.

## Conclusion

While this study does not cover sufficient numbers to warrant any definite conclusions, the following comments seem to be pertinent:

- The study did not reveal lead hazards to small children in Minneapolis which could be traced to conditions inside of the homes, although the possibility that such hazards exist cannot be completely excluded.

- The finding of some cases of high urinary lead levels among small children in the absence of symptoms of lead poisoning seems to parallel the seasonal incidence of lead poisoning found in children in other cities.

- The paucity of actual lead poisoning among small children living in poorly maintained houses in Minneapolis may be related to a shorter summer season (shorter exposure period) rather than to any difference in the hazard associated with falling exterior lead paint.

- Health departments and housing authorities, in concern for the health of small children living in houses where the exterior paint is chipping off, should consider developing control procedures (8).

- Parents and the public should be warned of the health hazard of small children ingesting the paint which has chipped off walls of houses and outbuildings.

## Summary

Between August 25, 1958, and October 10, 1959, a total of 417 specimens of urine from children (5 years and under, without symptoms of lead poisoning) were analyzed for lead at the Minneapolis Health Department laboratory. Of these specimens, 393 were obtained through a screening program carried out in

well-child clinics, turning up 7 with high urinary lead. The remaining 24 specimens were obtained from children living in houses selected for study because of their obviously peeling paint. Among the latter specimens, nine were found to be high in lead content. While screening through the well-child clinics lasted nearly 14 months, the study among children living in the preselected homes was carried out only during July, August, and September of 1959.

All of the specimens with high urinary lead were associated with peeling exterior house paint, except for two cases found through the well-child clinics. In these two instances the source of lead was traced to lead dust brought home on the clothing of two adults who worked in a storage-battery manufacturing plant. When the figures of the two studies are combined, 14 out of 29 children living in 19 houses with peeling paint had high urinary lead levels. All of these 14 children are believed to have ingested the lead although only 3 had a definite history of pica. The children played in the dirt adjacent to the houses where peeling paint had fallen into the play areas.

None of the children with high urinary lead manifested sufficient signs or symptoms to warrant a diagnosis of lead poisoning and by late October, almost all urinary levels had returned to normal.

All of the high urinary lead levels appeared during the summer, suggesting a seasonal outdoor exposure and the absence of significant all-year inside exposures.

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*Jobs and Futures in Mental Health Work.* Public Affairs Pamphlet No. 296. By Elizabeth Ogg. April 1960; 28 pages; 25 cents. Public Affairs Pamphlets, 22 East 38th Street, New York 16.

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# The Anatomy of an Accident

ALBERT L. CHAPMAN, M.D.

**A**CCIDENT is a word applied to the culmination of a series of events which result in harm to the individual or damage to property.

Accidents originate in unsafe acts. The end result of a small proportion of unsafe acts is an accident.

A small proportion of accidents result in accidental injuries. Accidental deaths are the end results of a very much smaller proportion of accidents.

In essence no accidental death, no accidental injury, in fact no accident, can occur unless it is preceded by an unsafe act.

Therefore, the most important element that accident prevention programs must seek to eradicate are unsafe acts themselves.

An example may serve a useful purpose. A man walking along a city street was hit on the head by a flowerpot. His skull was fractured. Two days later he died. Here was an accident, an accidental injury, and an accidental death. But where was the unsafe act?

Is it to be presumed that to be safe one must never walk on the sidewalks of a busy city street?

No! The victim of this accident engaged in no unsafe act, but—there was one—in fact there were at least two unsafe acts.

The mother who, to liven up her drab apartment, placed a potted plant on the window sill committed the first unsafe act. She had never been conditioned to think in terms of accident prevention. She gave no thought to the even-

tual consequences of what she did. The child who leaned out of the window to peer at the crowd below and in so doing brushed the potted plant off the window sill committed the second unsafe act.

Other unsafe acts were involved, of course. The building should not have been built with sills directly over the sidewalks and there should have been regulations prohibiting such dangerous practices as putting a potted plant on a window sill.

If the first or third unsafe act had not occurred, the second unsafe act would not have been possible.

This illustration serves to demonstrate that individuals cannot by living safely, and behaving safely, always insure themselves against accidental injury or death due to the ignorance or carelessness of others.

Accident prevention indoctrination must be directed not only toward self-preservation but also toward the protection of others.

In considering ways and means of preventing accidental deaths and injuries then the aim must be to prevent, or at least to greatly decrease, the incidence of unsafe acts. This is true since no one can predict precisely which unsafe act will result in an accidental death or in an accidental injury.

This same illustration demonstrates this point. If no one had been in the path of the falling flowerpot, the two unsafe acts which were committed would have caused an accident (the breaking of the flowerpot), but there would have been no accidental injury or death.

An accident has several sides. One side is the environmental side—the flowerpot on the window sill over the sidewalk. Another side is the

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*Dr. Chapman is Assistant Surgeon General and chief of the Division of Special Health Services, Public Health Service.*

human, or biological side—the act of placing the flowerpot on the window sill could have been avoided, and even after the flowerpot was placed on the window sill it was only knocked off by the act of an individual.

All of us live in an environment which is potentially dangerous, even lethal, depending upon circumstances, some of which are subject to our own control—some of which are subject to the control of others.

There is no such thing as a “safe” environment. There can only be “safer” environments. Human behavior, conditioned by physical, physiological, and emotional factors of great degrees of complexity, determine the occurrence or nonoccurrence of accidents far more often than environmental factors per se.

There is no such thing as a “safe” person. However, persons who have been motivated, trained, and conditioned to behave safely are much “safer” individuals than persons not so motivated, trained, and conditioned.

No matter how thoroughly an environment has been screened for accident-causing potentials, an unsafe person may have an accident or may cause an accident to happen if the circumstances are right.

In addition then to emphasizing the need to help people to adapt themselves to living safely in whatever environment they find themselves, there is a co-equal need to change the environment in such a way that it is less likely to invite accidents.

The paucity of human and financial resources available for expenditures in educating, training, and conditioning individuals to adjust safely to their habitat makes it imperative to conduct studies, call them epidemiological if you will, that will identify those human characteristics which are most productive of accidents. If this is not done, our relatively meager resources will be expended on activities that have the potential for saving only a few lives while activities which have the potential for saving many lives are left undone.

Examples of the types of studies which can give direction to community safety activities are:

- Determining through surveys in homes the actual places where medicines and household poisons are stored.

- Investigating the causes of home fires: for example, faulty electrical wiring, mishandling of kerosene, and improper storage of flammable materials.

- Studying the circumstances surrounding drownings in a community. These can shed considerable light on causative factors, many of which are subject to correction: age, sex, and swimming ability of the person drowned; enclosure of fishponds and swimming pools; and artificial respiration attempted, if any.

This obvious plea to apply scientific counting methods in order to identify the major factors which cause accidents in each locality must, of course, be modified by the need to take advantage of the peculiar interest of each individual and of each community group.

Logic is quite alien to many community activities. Logic alone should not deter anyone from doing the best that can be done under existing circumstances.

Another major factor to be considered in mounting an attack on accidents is the existence or absence of specific measures which will prevent a certain type of accident.

For example, there may be widespread community interest in the development of a poison control program, yet there may be little interest in making radical changes in driver-licensing laws.

A local poison control program may have the potential of saving only 5 lives a year, whereas making the requirements for driver licensing much more drastic may have the potential for saving 50 lives a year in the same community.

The first program is much easier for the lay person to understand; it involves no great sacrifice of personal liberty, and it can actually be developed as a part of existing institutions and organizations.

The latter program is much more remotely associated with accident prevention; its beneficial effects are more difficult to appreciate, it involves more deprivation of personal liberty (a license), and hence must await the preparation of the community mind for its fulfillment. This may take many years.

In summary, then, the fundamental nature of accidents and the inevitable association of unsafe acts, accidental injuries, and accidental deaths must be imparted not only to community

leaders but to the public—to the man on the street.

The fact that there can be no monopoly in accident prevention by individuals or groups is a basic tenet. Every person, every organization, and every agency has a personal as well as an organizational contribution to make to the safety movement.

Leadership, of course, can best stem from specific organizations whose sole function is to prevent or bring about the prevention of accidents. I am speaking specifically of the National Safety Council and State and local safety

councils associated with the National Safety Council.

Finally, a simple truth must be implanted firmly in every mind; namely, that accidents don't happen, they are caused—they are caused by what people do or by what they fail to do.

Acceptance of this truth means that one must admit that since human action can be modified, accidents with rare exceptions are preventable occurrences, and that the same resources mobilized to combat heart disease, cancer, and mental illness should be committed in much larger amounts to the prevention of accidents.

## Radiological Health Curriculums in Schools of Public Health

Within the past few years radiological courses have been introduced into most schools of public health, and curriculums specializing in radiological health are currently being offered at several schools. In addition, certain schools have developed a general radiological course which may be included in the curriculum for those students having only an ancillary interest in radiological health. Radiological health training in schools of public health concerns health agencies because radiation safety programs employ many radiation specialists with basic training in biology, chemistry, physics, and engineering. To provide leadership and direction in this field requires personnel versed in radiation and public health.

Schools offering specialized training include Harvard, Johns Hopkins, Pittsburgh, and Michigan. The curriculums initially developed at these schools varied significantly, both in number and types of courses required for an advanced degree. The current trend, however, appears to be toward development of curriculums incorporating basic public health courses plus radiological courses. The public health courses may include epidemiology, biostatistics, and public health administration, whereas the radiological courses include radiobiology, radiation physics, radiation protection and control, and other topics. Flex-

ible rather than rigid or standard programs also appear to be the general trend.

During this transitional and developmental stage of these radiological health curriculums, the schools are interested in exchanging opinions concerning both the quantitative and qualitative aspects of these curriculums. For example, they ask what is the probable demand for radiological health specialists, and are there sufficient university resources to meet these needs? What should be the basic or minimum curriculum for schools specializing in radiological health? To what extent should all school of public health graduates be trained in radiological health? Is further curriculum specialization indicated, directed toward dosimetry, radioecology, biophysics, or political science?

An important aspect in resolving the latter question is the scope of other radiological health training programs being offered in other areas, for example, in schools of medicine and engineering, or in health physics or radiation biophysics programs. Essentially, the status of curriculum development in each of these areas is comparable to that in schools of public health. Thus, it is likely that they would also like to exchange viewpoints and information.

In an effort to provide this opportunity for university personnel, the Division of Radiological Health of the Public Health Service is planning to sponsor a 3-day symposium this summer on the topic "University Curricula in Radiological Health." The symposium will be held August 2-4, 1960, in Princeton, N.J. University staff members, principally from schools of public health, medicine, and engineering, will be invited to participate in the discussions. Altogether, the purposes of this symposium will be to discuss: (a) requirements for radiological health personnel, (b) trends and experience in development of basic radiological health curriculums for various professional disciplines, and (c) staffing, cost, and other problems associated with university radiological health programs.

It is hoped that the symposium being planned, whereby representatives of universities, professional societies, and health agencies may jointly contribute, will assure an orderly progress in the field of radiological health training and thereby further the application of nuclear technology with full regard to the safety of present and future generations.—DONALD A. PECO, acting chief, Training Branch, Division of Radiological Health, Public Health Service.

## Cause and Prevention of Accidents

WILBAR, Jr., M.D.

[illegible]

injuries in Pennsylvania during the year, using this formula.

Accidents are prevented by first locating the causes. After having ascertained the causes,

*Dr. Wilbar is secretary of health, Pennsylvania Department of Health. This paper is a condensation of an address which he delivered to the junior-senior class of the Hahnemann Medical School in January 1960.*

steps are then taken to either correct or modify the environmental hazard or to change the attitudes and habits of the people involved, or both. The Pennsylvania Department of Health through its section of environmental safety is engaged in a survey of the types of accidents that bring people to hospitals.

Information on nonfatal injuries is gathered from 100 hospitals reporting accidental injuries treated to the health department. They show a difference compared to data on types of fatal accidents experienced. There is a higher rate of injuries from nonfatal falls in the middle years of life, but a higher rate of fatal falls in the early and late years. Cuts and piercing injuries seldom prove fatal, yet there are indications that these may be the major forms of non-fatal accidental injuries.

Most nontraffic accidents occur in the home, where the population spends more time than elsewhere. Probably accident prevention measures are less adequately applied in the home than in the working environment. That home accidents can be largely prevented has been shown by concentrated accident prevention programs in selected communities.

As to the personal factors in accident rates, there is a considerable variation in accordance with age. Most fatal injuries occur to persons in the very young and very old age groups, whereas most nonfatal accidents occur in the age group 15 through 24 years. Males have a much higher accident rate than females. Non-whites have a much higher rate than whites. Physical shortcomings which interfere with coordination, balance, and locomotion obviously predispose individuals having these shortcomings to accidents. So do certain visual and auditory abnormalities and conditions, which prevent the individual from having mental



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research to help delineate the human factors which cause accidents; (d) encouraging and stimulating universities and other groups and institutions to engage in research; and (e) assisting in obtaining medical and related consultation for State motor vehicle administrators to help solve individual problems posed by drivers having an alleged physical, mental, or emotional defect.

Consultation toward solving problems of individual drivers who have frequent accidents and are alleged to have some defect has been in effect for a number of years in Pennsylvania. However, in the past we have mainly attempted to establish physical standards for drivers and the periodicity to which drivers should be subject to testing for these physical standards. The Pennsylvania Medical Society has a number of special committees working on standards, and a report was submitted to the Governor's Traffic Safety Council and to the secretary of health. These standards have recently been officially adopted by the Governor and will be enforced by the department of revenue.

Some of our drivers had never received any medical examination and most others had received only one eye examination. We found drivers picked up after accidents who were on the blind pension roll of the State or who had severe heart trouble, severe epilepsy, or other physical conditions which made them completely unfit for driving and most hazardous to themselves and to others. Periodic physical examinations, now required in the State by executive order, are not completely comprehensive but deal mainly with those parts of the body and those conditions which are particularly significant as far as driving a motor vehicle is concerned. It is hoped these examinations will reduce the deaths and injuries from motor vehicle accidents in our Commonwealth.

We are also finding that alcoholism and drug addiction seem to play a major role in motor vehicle accidents. Further study is needed in this area, but obviously such studies will yield significant data.

The skill and industry of private physicians have made possible the control of many of the once prevalent communicable diseases. The

same skill and industry, redirected toward reduction of accident rates, can be depended on confidently to achieve a great deal. Health departments, safety councils, police departments, motor vehicle administrators, and others do at best a shotgun type of education for all of the public. It is the private physician who can determine the accident-prone individual and take the necessary steps to educate him or his family to the extent of appreciably reducing his chances of being harmed.

The personal physician who is best acquainted with the physical, mental, and emotional needs of his patient can best advise against accidents in accordance with individual limits. Who better than the family physician can advise a husband or his wife that it is no longer safe for an oldster, living with them, to go up and down stairs? Who better than the family physician would be in a position to observe the repetition of accidents in a household and the need for referral to the health department for a discreet investigation of the circumstances existing in that household? The physician who has the prevention of home accidents uppermost in his mind will evaluate the patient's accident proneness even as he examines him for signs of disease.

In our State, poison information centers are now available in hospitals within reach of all of our physicians. Poison treatment centers are available in a number of our hospitals. A number of our county medical societies have accident prevention committees.

I believe that hospitals can provide accident prevention information to their patients and their staffs. I would like to see the day when at least one hospital in each major community has a poison treatment center as well as a poison information center. Hospitals can be helpful by recording accidental injuries, analyzing these data for study, and using them for accident prevention within their institutions and their communities.

On the premise that most accidents are preventable, all persons in the health professions can work together and enlist public support with assurance that the toll can be reduced.

control of his activities such as fainting, convulsions, heart attacks, cerebral hemorrhage, and such.

The mental and emotional makeup of the individual is undoubtedly a major factor as to his accident proneness. There is considerable controversy about the point at which a person becomes accident prone. However, it is clear that certain psychological factors in individuals cause them to be unusually likely to have accidents. An individual who is likely to worry or grieve predisposes himself to inattentiveness. An individual who is quick to anger is likely to lose the cautiousness which helps prevent accidents. Fatigue causes slowing of the reaction time, so that the chronically fatigued individual is more subject to accidents than others. The quality of judgment is difficult to measure, but certainly some individuals do better at judging their own skills and capabilities than others. Then there are, of course, those who have psychoses, psychoneuroses, or neuroses, some of which make them exceedingly accident prone. Accident proneness may not be constant; it may occur only for limited periods when physical or emotional conditions are acute.

Accidents can be prevented by the correction or modification of either environment or attitude. Carelessness, procrastination, disorderliness, confusion, and risks can be recognized and controlled. Correction of physical handicaps and reduction of emotional stress or tension are also possible. In our approach, we try to break the chain of events which leads to accidents. We tailor our educational messages for specific types of accidents and aim them particularly at the high-incidence groups. For example, to reduce gunshot wound accidents, we advise the public to store guns unloaded, to remove bolts before storing rifles, to keep firearms out of children's reach, to store guns in a dry dust-free place, to check the breech before cleaning, to keep loaded firearms out of the house, and to store ammunition separately from the gun or guns.

Under the State health department's plan for prevention and control of the nontraffic type of accidents, a central office advisory committee, composed of a representative of each of the professions and occupations in the department

concerned with accidents, helps to determine and guide the total control program. We have a regional accident prevention program representative on a full-time basis in each of our seven regional offices.

The reporting of accidents by the hospitals is cited above. Mortality reporting comes not only from the hospital but also from death certificates, all of which are filed and analyzed by the Pennsylvania Health Department. Compilation of data on morbidity, mortality, cause and cure, and studying followup of these data collectively and sometimes individually, supports an epidemiological study of accidents.

At the regional level, we need a regional staff steering committee, a home safety inventory, and especially do we need the formation of local safety councils, consisting of interested and able individuals and groups of individuals who will help collect data and bring about the educational know-how for the prevention of accidents in their communities. These councils provide a bridge or vehicle between the technical groups and the general public, and they should be comprehensive in their scope. They can have such subcommittees as home, farm, occupational, recreational, school, and traffic.

Motor vehicle accidents are given secondary attention here because a number of other agencies have been and are continuing to give much time and effort to traffic accident correction. These agencies, however, concern themselves mainly with the safety of the vehicle, the street and highway, and with mass education.

There has been too little concern, in my opinion, with the type of human beings who cause traffic accidents. Only recently have motor vehicle administrators turned to health departments for aid in this area. Since 1938, the section of traffic epidemiology has been headed by a full-time physician, but we are one of only a few State health departments which have such a unit. The job of the health department in this area is: (a) assisting in the establishment of physical standards by acting as liaison agency between the motor vehicle administrators and medical personnel within the State; (b) conducting statistical research, using records now reposing in State motor vehicle agency offices; (c) conducting applied

# California's Microfilm Program for Vital Statistics Records

PAUL W. SHIPLEY, B.S., and JAMES S. FULLER, B.A.

THE BUREAU of records and statistics of the California State Department of Public Health as a part of its functions directs the statewide registration of births, deaths, and marriages and provides service to the department and to the public with respect to these records.

The statewide registration of vital events began July 1, 1905, and in the 54 years since, more than 14½ million records have been registered with the department. Approximately 600,000 additional records will be registered during 1960. Two serious problems developed: we were being crowded out of our office by the sheer volume of records, and the older records which received greater use began to wear out.

An examination of these two problems, begun in 1947, developed into a survey by the department and the management analysis section of the State department of finance (1,2).

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*Mr. Shipley has been chief, bureau of records and statistics, California State Department of Public Health, during the 10½ years when the system described in the paper was developed. Mr. Fuller is administrative analyst with the California State Department of Finance and was formerly associate public health analyst in charge of the vital records section of the bureau.*

Mr. Shipley presented "California's Microfilm Program" before the methodology working group at the seventh national meeting of the Public Health Conference on Records and Statistics held in Washington, D.C., March 24-28, 1958. The methodology working group voted unanimously to publish his report. The paper is, in substance, based on Methodology Bulletin No. 8 of the Public Health Conference on Records and Statistics.

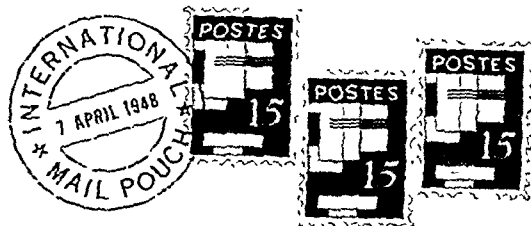
Assistance was also requested and received from many different sources.

Several possible solutions were explored. The traditional solution to crowding is to provide more space for storage and continue the accumulation of paper records. This practice was judged to be wasteful and shortsighted and in no way contributed to a solution of the second problem.

Review of the second difficulty, records wearing out from prolonged use, indicated that some substitute was needed for the original record. The use of microfilm, in lieu of the original record, appeared to have some advantages; it was a well-developed product enjoying wide use and acceptance, and it was relatively inexpensive. Further research revealed that under satisfactory storage conditions it was long lived. Microfilm appeared to be a possible solution to both problems.

A first important step was taken in 1948-49, when considerable effort was expended in the rehabilitation and transfer of all certificates to better filing equipment, in which the certificates are not bound. A State file number was stamped on all certificates. This number became an integral part of the indexing system, which is necessary to locate records or corresponding microfilm. The State file number is assigned as a consecutive serial number, 000001 through "n," for each type of record within each year of occurrence of event. The two digits representing the year of event are a part of the State file number and precede the six-digit serial number.

Several questions remained to be decided about the use of microfilm. What size film would be used? What reduction ratio was



## Kalinga Prize

Jean Rostand, French geneticist, won the \$2,800 Kalinga Prize for his 105-page book, "Can Man be Modified?" The prize is awarded by the Kalinga Foundation of India under the auspices of the United Nations Educational, Scientific, and Cultural Organization in recognition of an outstanding contribution to the interpretation of science for the general public. The author of some 50 other books, Rostand is known for his experiments in artificially induced parthenogenesis in animals and in directed mutation of toads and frogs by chilling their eggs to alter the chromosome structure.

## Working Conditions

Workers in the antimalarial campaign in Surinam face hazardous working conditions in some areas. Casualties have included a drowning in river rapids, a death from an accidental gunshot while hunting for food, vampire bat bites which required treatment for rabies, and bites of poisonous snakes.

—ROBERT BREWER, *sanitary engineer, formerly with the U.S. Operations Mission, Surinam.*

## Free of Yaws

Laos is now considered virtually free of yaws after 4 years of effort by two physicians and three teams of technicians. In the southern Provinces, they examined 463,165 persons and treated 16,990 with penicillin, an incidence of less than 4 percent. The technicians found few cases at altitudes of more than 800 meters. One team of workers will continue surveillance.

The World Health Organization delegated a physician to direct the yaws project, the Government of Laos paid the Lao personnel, and the U.S. Operations Mission provided supplies and supplementary stipends for the Lao employees.

—MANLY B. DONALDSON, M.D., *chief, public health division, U.S. Operations Mission, Laos.*

## Water for Libya

Developing domestic water systems in Libya requires ingenuity and a range of techniques because of the scarcity of resources common to arid regions and the extensive saline ground water aquifers underlying many towns. Individual dug wells, standard municipal well sources and distribution systems, and modern electrolysis demineralization plants are among the engineer's choices.

For example, to establish a municipal water supply to serve 10,000 persons in Misurata, 1 year of exploratory drilling and ground water studies was necessary to locate an adequate source of acceptable quality. The system, completed in July 1959, consists of three dug wells, a storage reservoir, 8 miles of supply mains, and an extensive municipal distribution system.

In planning a municipal system for Sierle, where the ground water underlying the area is saline, two sources and methods of development are being considered. One would use long galleries to skim the shallow layer of fresh water atop the salt water in sand dunes along the sea; the other would require drilling deep wells in areas remote from the ocean.

For the new hospital in Tobruk, a dual plumbing system carries both potable and saline water. An electrolysis demineralization plant produces 5,000 gallons of treated water per day. The potable water serves medical, drinking, and cooking purposes and the hot water system where it is necessary to conserve heating units and pipes. The saline water is used for general sanitation.

—PAUL AGNANO, *chief sanitary engineer, health and sanitation division, U.S. Operations Mission, Libya.*

## Maps and Malaria Eradication

Malaria eradication activities in Nepal are hampered by a scarcity of adequate maps. We obtained a few sheets from the Army Map Service and private sources, which were prepared in 1929 by the Surveyor General of India. They are already out of date and the scale, 1 inch to 4 miles, is much too small. Many villages are not on the maps and some that are marked are not named. As a stopgap solution, we've enlarged them with a pantograph and corrected them as fieldwork progresses.

—RAYMOND E. STANNARD, M.D., *chief, public health division, U.S. Operations Mission, Nepal.*

were done with this reader in an attempt to simulate the conditions which we expected our microfilm to survive. After several months it was concluded that attempts to reduce the wear caused by the reader were misguided; the film itself would not stand the usage we expected of it. At this point we became aware of recent developments in diazo-type film which, in essence, solved wear and tear.

### Duplicates and Enlargements

The diazo film duplicate is necessary whenever the microfilm becomes an active working record. The film surface is so much harder than gelatin emulsion that we did not have to give further consideration to reducing film wear and tear by the reader and the microfilm editor. Also, the diazo film duplicate is less expensive than conventional silver halide emulsion film. For these reasons, we decided to use a diazo print for the working record. It was necessary to develop standards and specifications for preparation of diazo-type duplicate film since none have yet been completely developed and published (5).

The ability to produce paper enlargements readily and economically is a necessity. For many years there was no piece of equipment on the market which would do the job. For 7 years this problem was discussed with everyone we could find who could possibly help. Many persons offered concrete suggestions for the design of such equipment, but no suitable equipment was available.

Finally in 1953 the Photostat Corporation was induced to join in the development of a microfilm reader-printer. A factory-engineered prototype was installed for shake-down tests in mid-1954. The machine had many unacceptable features and was finally rejected in December 1954. It was then decided to develop the machine on the job. With the assistance of the Photostat Corporation, satisfactory equipment designed to our specifications was developed and has been in use since July 1956.

The reader-printer has all of the features of a microfilm reader and the capability of producing automatically photocopies of selected images in daylight. The reader device is an

adaptation of a Kodagraph Reader Model MPE. The photocopy device is an adaptation of a Photostat Junior Continuous Model A. The other significant elements of the reader-printer are a two-phase remote control timer, a variable transformer to control the output of the projection lamp, and an automatic certification printer with selective lockout.

With this machine the operator can rapidly find a desired record image and produce a certified copy merely by pressing a button. The cycling time is about 25 seconds.

### Conclusion

With the completion of these studies and development of equipment, a specific proposal for a microfilm program met with administrative and legislative approval. During this process, necessary amendments were made to the State Health and Safety Code (6) and funds were appropriated to implement the program.

The essential parts of this program were put into operation in 1958. Following is the present procedure. Currently registered certificates of birth, death, and marriage are microfilmed on a rotary camera at a 17 to 1 reduction ratio on 16-mm. silver halide film. This film is used as a one-purpose current processing medium, that is, as a medium from which to punch tabulating cards from which statistical reports and indexes are prepared. The current processing film is filed in security storage within 2 or 3 months after receipt of certificates and serves as a temporary security copy until the permanent copy is prepared at the end of the lag period. During the lag period, the original certificates are used for all reference purposes, except for the key-punching medium.

After the lag period of 15 years for births and 5 years for deaths and marriages, a 16-mm. silver halide original film at a 17 to 1 ratio and a diazo duplicate film copy are prepared. The silver halide original film is placed in security storage, replacing the temporary security copy. The diazo duplicate film copy is used as the current working record. The diazo duplicate copy reflects all amendments on a current basis. Provision is made so that the silver halide security copy can, if needed, be used to prepare

most desirable? What kinds of equipment were most suitable? As answers were found for these questions, new ones were asked. The exploration of the possibility of using microfilm as a substitute for original records developed into a number of related studies.

### Certificate References

Our two basic requirements for any solution using microfilm as a working record were ability of the film system to accommodate amendments at any time (3) and adaptability to production of photographic copies of the record from the film at all times. These two requirements limited the solutions which would be acceptable.

To understand better the first requirement it was necessary to measure amendments quantitatively. A certificate reference study (4) was undertaken for a 1-year period in which annual reference rates were established per 1,000 certificates by type and age of certificate. In the analysis of the rates, particular attention was given to the references made for the purpose of amending certificates. There was a relatively high activity of certificate references for a relatively short time after filing of the certificates for marriages and deaths and a high reference activity over a much longer period for certificates of live birth.

Since a substantial part of this high reference rate was due to amendments to the records, it became apparent that considerable expense could be avoided in splicing the microfilms by instituting what we call a minimum lag period of 15 years for births and 5 years for marriages and deaths before the permanent microfilm security copy and noncurrent working copy were prepared.

During this lag period, the current processing copy of the film, which is used as a processing medium, is placed in security storage within a few months after the certificates are registered and is retained until it is replaced with the permanent security copy which is prepared at the end of the lag period.

### Film Systems and Amendments

We investigated the relative advantages of roll microfilm and microfilm card filing systems

in which a film image or images are inserted in a card which is then filed vertically in conventional card filing equipment. The latter system was rejected in favor of the former on two counts: the total cost of installing and maintaining a system for using microfilm filed in card form was much higher than for a roll form system, and the saving in storage space is greater when the roll system is used. Furthermore, we could find no real advantage to the card system except that it is a widely understood concept, whereas "rolls of records" is not.

These records are subject to amendment at any time. The amendment is, in fact, an accessory document. After amendment the record then becomes a two-document record. These accessory documents must be added to the rolls of film. The simplest and most economical method is to microfilm the amendments and splice them into the microfilm roll preceding the pertinent film image.

### Splicing, Editing, and Reading

There are two basic methods of film splicing. lap-weld and butt-weld. The former is the conventional splice system, in which the ends to be spliced are trimmed, buffed, coated with cement, overlaid, and held together for a short time to allow the cement to dry. The butt-weld system trims the ends to be joined, brings them together so that the ends join perfectly (but do not overlap), then welds the ends together by applying heat for a brief interval at the point of contact of the two film ends. No cement is used. It was decided to use the butt-weld splice since it is much stronger and faster than the lap-weld splice.

No machine existed for editing nonsprocketed roll microfilm, yet it is a virtual necessity if the film is to be amended. We contrived our editing device by converting a commercially available editor made for sprocketed 16-mm. cine-film.

We found many brands and styles of microfilm readers. Most were rather primitive by today's standards and were poorly designed in that little consideration had been given to wear and tear of film on its travels through the reader. The choice was finally narrowed to one reader. Several accelerated wear and tear tests

# New Knowledge and Current Problems in Human Virus Infections

LEONARD M. SCHUMAN, M.S., M.D., and PHILIP WORRELL, B.A.

FROM his most primitive existence, man's acquisition of knowledge, while helping to resolve existing problems, has created new and, at times, seemingly more complex problems which demand solution. This has seemed to be the effect of each increment to our knowledge of virus infections. As more viruses are discovered, the work of classifying, differentiating, and establishing the clinical significance of these agents becomes more intricate.

Until 1947, 60 viruses had been cataloged as producing illness in man (1) but only 18 of these were strictly human pathogens. The others, including the arbor or arthropod-borne viruses as well as viruses of other lower animals (zoonotic viruses) are not obligated to man for their parasitic existence. Thus, man served as the sole reservoir for but a small fraction of his virus infections. In 1947, the enterprise of Dalldorf and Sickles (2) in utilizing suckling mice for isolation of a pathogenic virus, other than poliovirus, from the stools of two upstate New York cases of suspected poliomyelitis opened the door to the identification, in the ensuing 10 years, of 19 types of Coxsackie A and 5 types of Coxsackie B viruses.

Although the Maitlands, several decades ago, pioneered tissue culture for the study of patho-

gens, the technique was complicated, if not formidable, since an additional animal host system was necessary to demonstrate that growth of virus had occurred. The major impetus to virus isolation and culture came with the discovery by Enders and his co-workers (3) in 1948 that clear-cut cytopathogenic effects indicating viral activity and growth could be demonstrated in tissue cultures directly, without the need for a secondary animal indicator system.

The virus utilized was the Lansing strain of poliovirus, and the *in vitro* hosts were roller-tube cultures of human extraneural tissue cells. Subsequently, monkey kidney tissue cultures and a variety of other types of cells growing *in vitro*, including HeLa cells, have been employed with good results.

In the 12 short years since the work of Dalldorf, a tremendous number of hitherto unrecognized viruses have been identified and serologically typed. Of these, 81 new types of human viruses have been isolated and characterized physically and serologically (table 1). This number is more than all the viruses, irrespective of reservoir, recognized in the preceding half century. Numerous new viruses from other animal sources (for example, ECMO, ECBO, ECCO, and arbor) have also been isolated; nearly every month brings new identifications.

In table 1, the viruses for which man is the principal or, more frequently, the sole reservoir are presented according to the period of their discovery and their group designation. The arboviruses are not included in the table, since, as far as we know, there are no exclusively

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*Dr. Schuman is professor of epidemiology in the School of Public Health, College of Medical Sciences, University of Minnesota. Mr. Worrell is a senior medical student at the university. This paper is based on one given at a symposium on viruses which was part of the 37th annual meeting of the American Public Health Association in Atlantic City, October 1959.*



another diazo duplicate which will reflect all amendments. The original records go to dead storage and can be destroyed on permissive legislative authority.

This system, designed primarily to use microfilm as a working record, has operated successfully now for more than 1½ years and appears to be an effective solution to the problem for which it was designed.

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## Legal note . . . Sanitation

Municipality enjoined from operating an open burning dump so as to create a nuisance. *Proulx, et al. v. Keene* (158 A. 2d 455, New Hampshire, February 1960).

In accordance with a State statute, requiring New Hampshire cities and towns to maintain public dumping facilities, the City of Keene established an open burning dump on land within its boundaries.

Plaintiffs sought to enjoin the operation of the dump as a nuisance, complaining that it subjected them to substantial annoyance from smoke and odors, interfered with the enjoyment of their properties, and depreciated the value of their land.

The lower court found that charred and unburned paper and debris were blown from the dump onto lands of the plaintiffs. Frequent smoke and odors also occurred, which were at times "almost sickening to smell," caused a "burning" sensation of the eyes, and required that bedroom windows be closed and picnics be held indoors.

Appealing from the decision of the lower court granting an injunction, counsel for the City of Keene argued, among other things,

that the city, being required by State law to maintain the dump, could not be enjoined from performing its duties. The Supreme Court of New Hampshire disposed of this argument by pointing out that the State law specifically provided that the disposition of waste must be in such a manner as not to create a nuisance, and that the injunction did not prohibit the operation of the dump entirely but only its operation in such a manner as to permit the escape of smoke, odors, and debris to plaintiffs' lands.

The court noted that although the city was exercising a public right in performance of a public duty imposed on it, its use of its land could not be unreasonable as against adjoining landowners. In upholding the injunction, the court found that the evidence supported the decision that in this case the use of the land for a burning dump was unreasonable.—SIDNEY EDELMAN, assistant chief, Public Health Division, Office of the General Counsel, Department of Health, Education, and Welfare.

# virus types with human illness <sup>1</sup>

Adenovirus types		Myxovirus types	Other types
Common	Less common		
4, 7	3, 14	Parainfluenza 1, 2, 3.	JH, 2060, CCA.
		Parainfluenza 1, 2.	
1, 2, 3, 5		Parainfluenza 3.	
3, 7a	1, 2, 5, 6, 14		
3, 7a	2, 6, 9, 10		
8 (classic)	3, 7a (mild)		
7a	1, 3	Parainfluenza 1, 3.	CCA.
4, 7	1, 3		SGV.

An analogous situation prevails for illnesses predominantly referable to the central nervous system (CNS).

In the happy, unenlightened first quarter of this century, poliovirus infections leading to paralysis were much more frequently recognized and reported than nonparalytic forms. This was so despite the careful description of abortive forms of poliomyelitis by Wickman in 1907 (20) and the reiteration by Lavinder, Freeman, and Frost (21) in 1918 that poliomyelitis very frequently occurs without paralysis.

However, by the fifth decade of this century, recognition of nonparalytic poliomyelitis based on signs of meningeal involvement during the poliomyelitis season had become universal in the United States. In Minnesota, for example, in the period 1947 to 1953 the proportion of nonparalytic to paralytic poliomyelitis reports stabilized at approximately the 1:1 level (22). From time to time, outbreaks of predominantly

nonparalytic poliomyelitis were recorded. The Illinois Department of Public Health records for 1951 show, for instance, that of the more than 100 cases of poliomyelitis occurring in Champaign County only an extremely small percentage were paralytic. Although such outbreaks were considered most unusual, facilities were not then available in Illinois for laboratory differentiation of the viruses involved.

It was only in the late forties that the work of Dalldorf and of Enders opened up new techniques for virus isolation, and still later that workers began to isolate hitherto unknown viruses from cases of central nervous system infections and other related diseases. Causal relationships began to be clarified through these techniques, which also permitted simplified and economical antibody titration.

As late as 1955 in Minnesota, however, the actual cause of much nonparalytic disease involving the central nervous system, which was then being diagnosed as nonparalytic poliomyelitis, could not be determined. Whereas poliovirus was isolated from 75-90 percent of the cases of paralytic poliomyelitis in 1955, only 13 percent of the so-called nonparalytic poliomyelitis cases yielded poliovirus isolations. Although antibody studies verified an additional percentage of true cases of nonparalytic polio, a significant number of cases remained etiologically unexplained. In retrospect, at least some of these could have been caused by Cocksackie or ECHO viruses.

Again in the late forties, Wallgren's diagnosis of "aseptic meningitis" (23), originally designed to differentiate nonspecific or allergic meningitis from specific infections of the central nervous system, regained favor. The nonspecific character of the diagnosis of aseptic meningitis recently has been reaffirmed by the large number of polio, Cocksackie, and ECHO viruses found to be responsible for nonparalytic central nervous system disease (table 2). Thus, aseptic meningitis, a syndrome rather than a specific disease entity, bears no etiological significance without laboratory-determined agent designation.

To add to the problems of clinical differentiation engendered by a diversity of agents, the recent demonstration of transient mild paralysis accompanying Cocksackie A7 and A9 infections.

Table 2. Association of enterovirus, adenovirus, myxovirus, and other

Illness	Enteroviruses			
	Polio types	Coxsackie A types	Coxsackie B types	ECHO types
Paralysis (complete to slight muscle weakness).....	1, 2, 3.....	7, 9.....	3, 4, 5.....	2, 4, 6, 16.....
Myocarditis or encephalomyocarditis (neonatal and early childhood).....			2, 3, 4.....	
Epidemic pleurodynia.....			1, 2, 3, 4, 5.....	
Herpangina.....		2, 3, 4, 5, 6, 8, 10, 16.....		
Aseptic meningitis.....	1, 2, 3.....	7, 9.....	1, 2, 3, 4, 5.....	2, 3, 4, 5, 6, 9, 14, 16.....
Epidemic exanthems:				
Boston exanthem and summer rash.....		16.....		4, 9, 16.....
Meningoencephalitis with rash.....				9.....
Summer diarrhea.....				18, 19.....
Acute febrile respiratory disease (summer gripe) most common.....	1, 2, 3.....	Many types.....	Many types.....	Many types.....
Acute undifferentiated respiratory disease.....				
Acute laryngotracheobronchitis.....				
Acute febrile pharyngitis.....				
Pharyngoconjunctival fever.....				
Follicular conjunctivitis.....				
Epidemic keratoconjunctivitis.....				
Viral pneumonia:				
Infants and children.....				
Adults.....				
Cytomegalic inclusion disease.....				

<sup>1</sup> Adapted from several sources (9,12)

CCA—Chimpanzee coryza agent, or respiratory syncytial virus.

SGV—Salivary gland virus.

isolated from more than a very small percentage of cases of similar illnesses in civilian families (17). Rhodes and Van Rooyen (18) also feel it unlikely that more than a small percentage of colds occurring in the civilian population are due to adenoviruses. Even in military outbreaks a "large proportion of cases of typical ARD shows no evidence of infection with adenoviruses, and its etiology remains unknown" (19).

Furthermore, the enteroviruses, including poliovirus, are quite frequently responsible for undifferentiated febrile illness, often with respiratory symptoms (9).

In an extensive epidemiological and virological study of poliomyelitis in Minnesota in 1955, 1,272 fecal specimens from family contacts of poliomyelitis patients were examined for virus. Of these, 469 specimens were from family contacts of 175 patients from whom poliovirus had been isolated. One hundred and eighty-eight

(40 percent) of the 469 specimens were positive for poliovirus.

In table 3, the 469 contacts are distributed according to their symptoms elicited in the course of surveillance. Only 109 showed any symptoms. The "pharyngeal" group, constituting 54 percent of the contacts showing any symptoms, included those with sore throats or history of a "cold." The "fever" group included those with fever alone or fever and other symptoms not included in the pharyngeal or meningeal complex. It is of interest that poliovirus was isolated from 63 percent of the contacts with pharyngeal symptoms.

From these several documentations and observations it is abundantly clear that the clinical illnesses of respiratory character presented in table 2 cannot be ascribed to a solitary virus group. Thus, clinical differentiation with etiological overtones is not possible without virus laboratory definition.

nurses and medical students obtained clinical histories and stool specimens on all family contacts of patients with CNS infections. Stools were examined for virus, utilizing HeLa cell cultures, and paired serums were examined for antibody titer increases. Exclusion tests for mumps, St. Louis and western encephalitis, and for lymphocytic choriomeningitis were also applied. A search for Coxsackie and ECHO viruses was not part of the laboratory routine in 1955, although 27 cytopathogenic agents were isolated from patients or contacts and identified the following year.

Six hundred and forty-nine cases of CNS disease, the total State caseload, were processed in 1955. Table 4 compares the originally reported diagnoses for these cases of CNS disease with the final diagnoses established after completion of either virus isolation, or antibody titrations, or both.

The physicians who reported cases as paralytic poliomyelitis were correct 152 out of 163 times, or for 93 percent of the cases so reported. However, only 269 (59 percent) of the 457 cases originally reported as suspect poliomyelitis or nonparalytic poliomyelitis were finally designated as nonparalytic poliomyelitis. The remaining nonparalytic or suspected poliomyelitis cases were ultimately distributed among paralytic poliomyelitis (55 cases); mumps encephalitis (24 cases); lymphocytic chorio-

meningitis (4 cases); aseptic meningitis (45 cases); and other illnesses, including Guillain-Barré syndrome, bacterial meningitis, and transverse myelitis (60 cases).

Aseptic meningitis in this study was a diagnosis ascribed to cases which fulfilled all the following criteria:

1. No poliovirus isolated from submitted stools.
2. Absence of paralysis.
3. Absence of serum antibodies to any type of poliovirus.
4. Failure to establish a diagnosis of other etiologically definable CNS disease by serologic methods.
5. Pleocytosis in cerebrospinal fluid.
6. History of meningoencephalitic symptoms.

Of 25 cases of mumps established serologically, only 1 had been initially diagnosed clinically. In 14 of these cases, there was either a history of recent parotitis or parotitis developed shortly after report. The other 11 cases were without parotitis. Furthermore, although physicians reported infectious encephalitis 16 times, none was confirmed for western or St. Louis types.

This study indicates that although paralytic disease is still preponderantly poliomyelitis and, in the face of an outbreak of paralytic disease, the physician's clinical impression of poliomyelitis most frequently proves to be cor-

**Table 4. Comparison of originally reported diagnoses with final diagnoses in CNS cases investigated during poliomyelitis surveillance in Minnesota, 1955**

Originally reported diagnoses	Final diagnoses							Total
	Paralytic poliomyelitis	Nonparalytic poliomyelitis	Mumps	Lymphocytic choriomeningitis	Aseptic meningitis	Western and St. Louis encephalitis	Other	
Suspect poliomyelitis.....	19	85	19	1	15	0	54	193
Paralytic poliomyelitis.....	152	5	0	1	0	0	5	163
Nonparalytic poliomyelitis.....	36	184	5	3	30	0	6	264
Mumps.....	0	2	1	0	0	0	1	4
Lymphocytic choriomeningitis.....	0	1	0	0	0	0	0	1
Aseptic meningitis.....	0	7	0	0	1	0	0	8
Western and St. Louis encephalitis.....	0	4	0	0	1	0	11	16
Total.....	207	288	25	5	47	0	77	619

Sources: Studies by the school of public health, University of Minnesota, and the department of bacteriology and immunology, Minnesota Department of Health.

as well as infections with ECHO types 2, 4, 6, and 16, and the demonstration of polioliike lesions in mice and monkeys infected with Cox-sackie A7 and A14 viruses (13) have complicated the picture of paralytic polio also. Even in the face of paralytic phenomena, a clinical diagnosis of poliomyelitis can be treacherous except under epidemiological conditions to be noted later.

Diagnosis of the time-honored exanthemata has also been affected by the problems unfolded in recent virus research. In 1951 in Boston, and again in 1954 in Pittsburgh, Neva and others (24,25) studied outbreaks of a febrile exanthem in which a pink maculopapular rash appeared on the face, trunk, and limbs, along with muscle pain and headache. The agent isolated on human fibroblast cultures has now been identified as ECHO 16.

In England, during the summer of 1954, viruses with the characteristics of the ECHO group were isolated from 5 of 6 stool specimens of infants, 3-14 months of age, who were exhibiting irritability, fever, a maculopapular rash, superficial lymphadenopathy, vomiting, and diarrhea. But for pleocytosis of the cerebrospinal fluid, these illnesses could readily have been confused with rubella (26).

Since then, a number of outbreaks have been reported in which symptoms and signs referable to aseptic meningitis were complicated by rashes variously described as rubelliform

(27-32) and scarlatiniform (33). In all these outbreaks, ECHO 9 strains were isolated. Since rash was a symptom in only 30-40 percent of the cases identified as ECHO 9 infections, it is obvious that the majority of the cases presented aseptic meningitis syndrome only. Without the correlative laboratory isolations of ECHO 9 virus, outbreaks of two separate diseases might have been inferred. In fact, in the early weeks of the Minnesota 1957 outbreak of ECHO 9 aseptic meningitis, the largest to date, with 424,000 cases extrapolated from a random sample family survey (31), one local health officer did derive this inference: with considerable concern, he stated that in his area he had two epidemics going at the same time—one of nonparalytic polio and the other of Boston exanthem.

### Epidemiological Implications

It is obvious that the isolation of 24 types of Cocksackie and at least 24 types of ECHO viruses, many of which are responsible for acute central nervous system infections frequently occurring in outbreak form, has made the diagnosis of nonparalytic poliomyelitis almost impossible to establish clinically. The significance of this difficulty in the evaluation of vaccine efficacy and in epidemiological investigations in general is also quite obvious. Surveillance programs for central nervous system infections, as a result, have had to be coupled with services of a competent virus diagnostic laboratory. Only the laboratory can define an entity etiologically when the syndrome can be produced by a variety of agents. The same principle applies to the entire field of new virus infections, whether they produce CNS, gastrointestinal, or respiratory disease.

The necessity for observing the principle with CNS diseases impressed itself upon us in Minnesota in 1955, when Salk polio vaccine was applied to a virgin population. Questions of safety and efficacy required the establishment of a surveillance program for CNS infections (22).

Physicians and hospitals were highly cooperative, not only in reporting, but in the submission of stools and paired blood samples from their patients. Health department and county

**Table 3. Poliovirus isolations from family contacts of patients from whom poliovirus was recovered, according to symptoms of contacts, Minnesota, 1955**

Symptoms of contacts	Number of contacts	Poliovirus isolations	
		Number	Percent
Any symptoms.....	109	72	66
Pharyngeal group.....	59	37	63
Meningeal group.....	13	6	46
Fever group.....	37	29	78
No symptoms.....	360	116	32
Total.....	469	188	40

SOURCE: Studies by the school of public health, University of Minnesota, and the department of bacteriology and immunology, Minnesota Department of Health.

cause of his disease. Time proved many organisms to be nonpathogenic; there may also be a normal viral "flora."

Merely finding an adenovirus in throat washings or an enterovirus in the stool of a sick patient does not establish a causal relationship. Their isolations may be coincidental, and several types may be isolated from the same patient during the same illness. Even a rise in antibody titer for a given viral type is not in itself proof of causation, for heterotype responses may occur. Most of the studies attempting to relate agents to disease have involved isolations from throat washings or stools, and there are those investigators who would demand viremia, rarely encountered, as proof.

There is even some evidence that virus recovered from an anatomic site of disease may not be adequate proof that the isolated virus is the cause. Melnick (38) cites the finding by Israeli investigators of Coxsackie virus in the spinal fluids of two patients with brain tumor and suggests that even penetration of the blood-brain barrier would thus not constitute proof of causality.

The highly frequent finding of the agent in cases of a disease with clinical distinctness and its absence from cases of other illnesses is suggested as a first step in establishing etiology. That this would not often be achieved in markedly similar syndromes has already been implied in our discussion of clinical specificity.

However, the markedly higher incidence of a given virus in patients with a given syndrome than in healthy controls selected from a comparable segment of the population would constitute strong incriminating evidence. The isolation of a virus, its production of the specific disease in volunteers, and recovery of the virus from the newly induced cases (with suitable controls) would be the ideal method but for the fact that, for a number of agents, infection takes place early in childhood and results in immunity.

No single one of these criteria, with the exception of the controlled volunteer study, would in itself constitute proof of an etiological relationship, but, in the aggregate, a strong association could be surmised. Sporadic cases, or even very small groups of cases, would rarely

provide us with an aggregate of positive criteria. Since causality, in the last analysis, is a matter of inference drawn from repeated strong associations, epidemics of disease provide us with the type of material necessary for the establishment of etiological relationships. In this regard, then, not only does the epidemiologist need the virologist and the clinician, but for a long time to come, the virologist and the clinician will need the services of an epidemiologist.

At the present time, despite the tremendous gains in understanding achieved in the past 12 years, our knowledge of the relationship of the newer viral agents to illness in the human population rests just above the primitive level. We can be confident, however, that within not too many years, certain "orphans" will have found a home even though some of them will prove to be commensals without behavior problems.

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rect, his "batting average" for nonparalytic disease is quite disappointing.

Another important epidemiological implication of the isolation of numerous viral agents is their temporal distribution in communities. Although the newly discovered enteroviruses, adenoviruses, and myxoviruses, by direct isolations and evidence of specific antibodies in serums, have been shown to occur in all parts of the world, specific communities experience rises and declines in the amount of infection and disease caused by these agents.

Observations in Minnesota reveal a provocative reciprocal interdependence of predominating enterovirus types year by year. With continuing poliomyelitis surveillance by the Minnesota Department of Health, CNS disease is thoroughly investigated and stool and other specimens are examined for virus content. After typing, confirmations are performed by the virus laboratory of the University of Minnesota department of bacteriology and immunology under the direction of Dr. J. T. Syverton.

Table 5 presents the Minnesota enterovirus experience for the years 1955 through 1958. In each year a specific enterovirus type predominated almost to the exclusion of others. In 1955, poliovirus predominated; in 1956, Coxsackie B5 was apparently responsible for the bulk of the CNS cases; in 1957, the largest recorded outbreak of ECHO 9 meningoencepha-

litis with rash occurred; and in 1958, Coxsackie B5 returned. Although data on virus isolations are not complete, poliovirus was apparently in ascendancy in 1959, with preliminary reports through December 31 indicating that of 237 cases reported, 198 (84 percent) were paralytic. Furthermore, most of the recent incidences and outbreaks of poliomyelitis have been either solely, or at least predominantly, of one type.

The significance of these data is not clear. Is this a pure chance interdigitation of separate and distinct secular cyclings of the several agents? Or is an interference phenomenon, repeatedly documented in the laboratory for such pairs of agents as one poliovirus type and another one of its heterotypes (34-36), and poliovirus and Coxsackie B (37), operating outside the laboratory? If such interference is, in fact, occurring in nature, then the implications for vaccination, especially with mixtures of live viruses, may be quite important.

#### Viruses Still in Search of Disease

Referring again to table 2, it is immediately apparent that not all of the isolated new viral agents have been incriminated in human illness despite their isolation from human sources. For example, although 18 adenovirus types have been isolated, only 11 of them have been established as productive of human illness. In the Coxsackie A group, only 10 of the 19 types have been incriminated, and of the 24 ECHO types, approximately 10. Many of the viruses which have not yet been causally related are the more recent discoveries, and it is highly probable that such relationships will ultimately be established for a number of them. Furthermore, there is every reason to believe that new types will continue to be isolated and, as aberrant characteristics are elicited, new groups formed. It is likely that viruses will continue to be in search of disease.

The establishment of causal relationship between the many new virus types and human disease is a complex operation. We find ourselves at present in the same position with virology as we were with bacteriology in the early years of this century, when any bacterium isolated from a patient was considered the

**Table 5. Isolations of enteroviruses from CNS and related cases in Minnesota, 1955-58**

Virus isolated	Year			
	1955	1956	1957	1958
Polio.....	175	47	9	12
Coxsackie:				
A 9.....	0	2	4	2
B 2.....	11	0	2	0
B 3.....	4	6	1	2
B 4.....	0	0	1	2
B 5.....	0	60	18	109
ECHO:				
1.....		0	6	0
6.....		0	2	1
9.....		0	149	5
Total.....	190	115	192	133

<sup>1</sup> Excludes isolations from 188 family contacts.

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## Carcinoma in Blackfoot Indians

During the past 5 years, 1955-59, while carcinoma of the cervix uteri and carcinoma of the breast has been occurring with about equal incidence in the United States, carcinoma of the cervix has been found in some 12 women of the Blackfoot Indian tribe of Montana. This compares with only two Blackfoot women who in the comparable time period have been found to have carcinoma of the breast. The exact significance of this difference is not understood, and may be more apparent than real since it has only been during the past 3 years that any exten-

sive screening has been done for carcinoma of the cervix in this Indian group. Vital statistics for 1957 show about 3 to 4 deaths from cervix cancer to 1 death from breast cancer among all Indians.

The average Blackfoot Indian population on reservations during this time period has remained constant at about 4,000 enrollees, of whom approximately 1,000 were women in the age group above 20 years. The diagnoses of cervical carcinoma were all made after the women presented symptoms. Ages ranged from 24 to 89 years. One of the breast carcinomas was discovered during a routine physical examination. Both of the patients with breast carcinoma were more than 60 years old.

The members of the tribe are becoming increasingly aware of the need for periodic screening for carcinomatous conditions.

In addition to the above mentioned lesions, carcinoma of the lung, kidney, gall bladder, stomach, and tongue has been seen in members of the Blackfoot Indian tribe during the same 5-year period.—  
EDWARD L. KING, M.D., *health officer, Browning, Mont.*



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It does not appear that there are many offices today where exposure is grossly in excess of present-day occupational standards, though there are a few where protective action is urgently needed. Film badges should be used much more widely to provide accurate documentation of all potentially exposed individuals and also to serve as a protection for the owner in case of legal action at a later date. We found rather widespread interest in personnel protection, although some older technicians and practitioners still consider it superfluous.

The item "Personnel shielding available" was evaluated with cognizance of stated caseload, giving some consideration to any probable increase in work during the next year or two. In an office using the X-ray unit for only a few limb or chest exposures a week, for example, special added personnel protection devices might not be considered necessary. The low level of exposure under these conditions has been substantiated by experience with film badges as reported in the literature (3-5). Thus, the high score attained by certain classes of practitioners may reflect the lack of need for such devices rather than the actual availability of personnel shielding.

The third item "Personnel dosimetry provided" appraised the actual documentation of

exposure in offices, even where exposure was suspected to be negligible. From the practical standpoint, this was interpreted to mean that film badges should be used to document personnel exposures, but not necessarily on a continuous basis. Occasionally, in hospitals, pocket ionization chamber dosimetry was encountered and considered acceptable. As is seen from table 2, documentation of exposure is inadequate except in hospitals. Use of dental films for personnel monitoring was considered to fulfill the criteria for this item in some cases, but dental films are not really satisfactory for personnel monitoring.

### Patient Exposure

The data on patient exposure were chosen out of a large and complex mass of information. "Satisfactory collimation in routine use" was evaluated with consideration of the types of examinations done in the office, the size of cones, their number, presence of diaphragms or variable aperture collimators plus correct use of equipment. The mere presence of three cones in an office, of course, is not enough to assure "satisfactory coning." They must be used at all times, and they must be exactly the right size. The more convenient variable aperture collimators were found in many hospitals and radiologists' offices and in a few other offices.

Table 1. X-ray users, machines, and estimated weekly caseload, Oregon survey, 1958-59

Item	Hospitals and radiologists' offices	Hospitals and clinics without radiologists	Physicians other than radiologists	Dentists	Osteopaths	Chiropractors	Veterinarians	Total
Total number of potential users <sup>1</sup>	58	10	331	244	60	21	26	750
Portland	40	2	199	144	41	13	16	455
Salem	7	0	97	60	10	6	4	184
Smaller towns <sup>2</sup>	11	8	35	40	9	2	6	111
Total number of machines studied	81	10	107	170	44	7	22	441
Portland	56	2	62	85	32	6	16	259
Salem	14	0	26	52	4	0	3	99
Other towns	11	8	19	33	8	1	3	83
Estimated radiographic examinations per week <sup>3</sup>	4,400	170	2,800	7,500	(4)	150		15,000
Estimated fluoroscopic examinations per week <sup>3</sup>	700	30	840		(4)	(4)		1,600

<sup>1</sup> Represents nearly 25 percent of the estimated total of X-ray units in the State.

<sup>2</sup> Smaller towns included Oregon City, The Dalles, Bend, Burns, Seaside, Woodburn, and others.

<sup>3</sup> The best estimates of actual weekly caseload in the entire State are 50,000-60,000 radiographic examinations per week and 5,000-6,000 fluoroscopic examinations per week.

<sup>4</sup> Inadequate data

# Findings of a Survey of X-Ray Units

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A FIELD survey of X-ray units used by all types of practitioners for diagnostic work was made in Oregon during 1958 and 1959 as part of the State's recently developed radiological health program. Results of this survey, along with a summary of the efficacy of steps that can be taken to protect the population from unnecessary exposure, are presented in this paper. Administrative and technical details of the survey have been published (1,2).

The survey sample included approximately 25 percent of the facilities used by an estimated 3,000 physicians, dentists, chiropractors, veterinarians, osteopaths, and chiropodists in Oregon. With the assistance of professional biostatisticians, the sample was picked to be representative of the State on a geographic and community-size basis.

Little if any systematic geographic variation was found in protection standards, nor did community size influence the findings in a predictable way. However, we did note that certain medium-size communities where local radiologists had made a special effort to improve protection appeared to be above the average.

The number of physicians of each type contacted and estimates of their caseloads are shown in table 1. In the absence of registration in Oregon, lists of practitioners were compiled from professional society registers and from the classified telephone books. We then picked a series of representative communities and called on every practitioner in the commu-

nity. During each visit we asked for an estimate of caseload, categorized as adult and pediatric patients, X-rays and fluoroscopy, X-ray pelvimetry studies, and other examinations. The data from hospitals were usually confirmed by examination of the daily work-book, but in many other offices we relied on estimates provided by the practitioner or technician. The average weekly caseloads for some practitioners seem surprisingly small, but at present there does not seem to be any way of verifying the number. In some areas it may be possible to obtain data on total sales of X-ray film.

Because of the comparatively small number of radiologists' offices outside of hospitals, we have included them within the category of "hospitals and radiologists." Hospitals (or oftentimes larger clinics in outlying communities), where the X-ray work was not supervised by a radiologist, are tabulated separately.

## Protective Practices

Table 2 offers a statistical summary of protective practices observed.

In regard to "Operator and assistants well protected during fluoroscopy," we found quite reasonable protection. The hospitals and radiologists were uniformly good on this point. In some of the smaller offices with fluoroscopes, gloves or aprons or both were unavailable. We also evaluated leakage around the unit or through the viewing glass and the presence of assisting personnel in connection with this item. Grossly dangerous fluoroscopic units were rarely encountered, such as one that produced 65 r a minute at the tabletop in air and was used without an apron and with cloth (non-leaded) gloves.

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lower exposures are possible and practical. The dose rate was measured with a condenser roentgen meter. Not many dose rates above 20 r/min. were found, but a fair number fell into the 10-20 r per minute range. On the other hand, satisfactory results were being obtained by many radiologists and some internists at 1-3 r/min. The recorded dose rate depends on the milliamperage used at the time of the measurement, and there is some variation in this parameter in practice. Most hospitals and radiologists had low fluoroscopic dose rates with satisfactory filtration. Units used by physicians other than radiologists were much less satisfactory in this regard.

Fluoroscopic dose rates were sought for veterinarians because of possible exposure to hands during animal examinations.

About a dozen pediatric fluoroscopes were encountered in the survey, most of which were used by several pediatricians practicing together in a clinic. The average dose rate was close to 10 r a minute and shuttering mechanisms were frequently unsatisfactory. Extensive recommendations were made on all these machines (often specially built from old X-ray parts), and in several places they were taken out of use entirely when the pediatricians

learned of the exposure hazard. It is believed that a single pediatric fluoroscopy can equal or exceed the 10 r value which is suggested as the limit for the average 30-year gonadal exposure of the population (10). We found it exceedingly difficult to obtain satisfactory data on the frequency of pediatric fluoroscopy.

The table does not include data on local shielding, partly because it was found so infrequently. Plain lead strips were available in many hospitals and radiologists' offices, but we have not been able to judge how frequently they are used as gonadal shields. Lead strips or sheets were rarely found in any other types of offices. Because of the limitations of coning, we feel it is most important to recommend careful gonadal shielding for all persons under 40. Gonadal shielding must, in our opinion, be provided as an adjunct to coning for the most critical abdominal and pelvic examinations.

Table 3 shows the effects of a series of modifications on the doses of radiation a patient would receive in an ordinary X-ray of the pelvis (7, 8, 11-13). It should provide some perspective on the importance of protective recommendations. Added filtration and higher kilovoltage have somewhat the same effect in

**Table 3. Effects of technical improvements on radiation doses received from anteroposterior projection of the pelvis <sup>1</sup>**

Kilovoltage	Added filter (mm. Al)	Altered parameter	Air dose		Depth dose at 8-9 cm.	
			Roentgens	Percentage of original value	Roentgens	Percentage of original value
60	None	Original conditions <sup>2</sup>	4.0	100	0.36	100
60	None	Full 5-minute development.	2.4	60	.22	60
60	0.5	Minimal filtration	1.8	45	.22	60
60	3.0	Full filtration	.5	12	.11	30
85	None	Increase kilovoltage	1.2	30	.22	60
85	3.0	Increase kilovoltage and full filtration.	.3	8	.11	30
85	3.0	Fast film	.2	5	.07	19
85	3.0	Fast film and cassette screens.	.13	3	.05	14
100	3.0	High kilovoltage technique.	.08	2	.03	8
		From commonly found technique to good modern technique.	Change of 4.0 to 0.13 r at skin.	Decrease to about 3 percent.	Change of 0.36 to 0.05 r at ovaries.	Decrease to about 14 percent.

<sup>1</sup> Based on data in references 7, 8, 11, 13. All numerical estimates have been rounded off and are subject to some variation from machine to machine.

<sup>2</sup> Underdevelopment at 3 minutes, standard speed film, par-speed cassette screens.

For dentists, the criterion was a field size  $2\frac{3}{4}$  inches or less in diameter at the tip of the pointer. For veterinarians, we thought it desirable to have some coning to limit scatter, but this was not considered critical as to size. For chiropractors, we used the same criteria as were applied to physicians.

The next item appraises filtration for radiographic work. The criteria used, 2.5 mm. total aluminum equivalent filtration for medical units and 1.5 mm. for dental units, are the values required by the NCRP standards and widely advised in the pertinent literature (6-9). Some dental units, particularly certain new models, need no added filter because of adequate inherent filtration. Veterinarians' units were subjected to the usual filtration standards so as to decrease scatter and other operator exposure.

Film processing was routinely evaluated. We frequently encountered 2-3½-minute development times, especially in dental offices. Special consideration was given to instances where the developer was normally kept at a higher temperature than 68° F. and where, therefore, full processing might occur in a shorter time. Occasionally 3½-minute development was considered acceptable for offices with small case-loads and where temperatures were actually measured and normally found to be above 68° F.

The kilovoltage used by Oregon practitioners was appraised. It must be stressed that this tabulation does not deal with true high kilovoltage technique, which means exposure in the range of 90 kilovolts and above for all thick parts. We obtained uniform data on the kilovoltage used for a posteroanterior projection of the chest and for a lateral projection of the lumbar spine which serve as two important typical exposures. The kilovoltage was judged "medium" if it was above 70 for the chest film and above 75 for the spine film. These figures were chosen on the basis of experience and consultation with radiologists. We found that many of the older machines are used at lower values. Some of them cannot be operated in the 75-90 kilovoltage range, which we recommend for all thick parts, but much more commonly the kilovoltages in use were simply taken from old exposure charts provided with the unit.

In connection with kilovoltages, it is pertinent to study table 3, which gives exposures associated with an ordinary A-P film of the pelvis.

#### Dose Rates

For fluoroscopy we used a criterion of less than 10 r per minute for the table-surface dose rate, as set by the NCRP (9). Substantially

Table 2. Percentage of X-ray users fulfilling protection criteria, Oregon survey, 1958-59

Protection criteria	Hospitals and radiologists' offices (81 units)	Hospitals and clinics without radiologists (10 units)	Physicians other than radiologists (107 units)	Dentists (170 units)	Osteopaths (44 units)	Chiropractors (7 units)	Veterinarians (22 units)
Operators and assistants well protected during fluoroscopy	97	84	82	-----	-----	66	23
Personnel shielding available	95	50	80	40	68	70	32
Personnel dosimetry provided	93	50	20	43	11	0	68
Satisfactory collimation used routinely	84	25	39	22	32	14	18
Adequate filtration for roentgenography <sup>1</sup>	91	50	38	38	29	0	9
Satisfactory development of films	68	50	56	18	39	57	5
Kilovoltage in medium range	80	50	33	4	18	0	0
Fluoroscopic dose rate below 10 r/min	97	66	62	-----	-----	-----	50
Fluoroscopic filtration equal to 2.5 mm. aluminum	88	50	46	-----	-----	-----	-----

<sup>1</sup> 1.5 mm. aluminum total equivalent, the standard established by the U.S. National Bureau of Standards in Handbook No. 60, was the criterion used for dental machines, and 2.5 mm. total filtration was considered satisfactory for medical radiographic machines.

in anyone with a reasonably high reproductive potential. X-ray pelvimetry and other exposures of mother and fetus are particularly important because they heavily expose the sensitive fetus or embryo and the maternal and fetal gonads. On the other hand, less detailed attention needs to be given X-rays of extremities or head or both and to unusual special procedures, such as angiography, which are done on sick persons; also to X-rays of a type done predominantly on older persons. For instance, a large percentage of male genitourinary studies are done with patients past the age of 40 for whom local shielding is less important. The value of having these considerations clearly in mind is that one can make a more reasonable request of the practitioner, namely, that he use the cumbersome and bothersome local shielding only where it is distinctly indicated.

The complex situation discussed above demonstrates that all types of practitioners will have to give their full cooperation to produce a real reduction in genetically significant radiation exposure. A single spinogram (full-length X-ray of spine) may produce a higher dose to the gonads than dozens of other radiographic examinations. A single pediatric fluoroscopy can easily produce exceptional gonadal exposure. Routine X-ray pelvimetry may offset the radiation safety efforts of radiologists and general practitioners not engaged in obstetrics. It appears clear that serious consideration should be given to any and all measures which may discourage or prevent the particular exposures which are of overriding importance.

We should like to make some comments at this point on the problems of field studies devoted to the magnitude of X-ray exposure of large populations. Such a project was considered but not actually attempted in Oregon. Because of the great individual variations in technique, particularly in coning and local shielding, we believe that the only accurate way to estimate gonadal dose associated with a given exposure of a patient is to measure it, using a standard phantom in the office where the X-ray was actually taken.

If attempting such a study, we would proceed as follows, in the light of what we have learned.

An entire medium-size community would be

appraised in the manner of our survey, but in addition, direct-beam and scatter measurements would be made in each office for several representative views, such as X-rays of the chest, abdomen, hips, and knee, using the phantom. Special measurements would be taken with dental units, pediatric fluoroscopes, and chiropractic units used for spinograms.

After all units were examined in this way, a sample of the population would be chosen for a detailed anamnestic study of all sources of radiation exposure during the preceding year. With prior measurements on hand, it would then be possible to make a good guess as to gonadal exposures associated with a given X-ray taken on a given unit. The problem here is the probable and understandable reluctance of practitioners to allow measurements in regard to any specific patient. On the basis of field experience, the application of extensive tables designed to derive gonadal doses from stated exposure conditions is subject to serious errors due to inaccuracies and variations in kilovolt and milliamperage settings, and most particularly because of difficulties in defining the extent of coning. In actuality, the only practical way coning can be defined with any assurance is to study the radiation field itself, either with fluorescent screens or instruments. We do not believe it is practical to expect "cone cuts" on all films at the present time. Rather unexpected vagaries have been found even in some variable aperture collimators, for example, nonuniform fields in which the intensity falls off at different rates in different directions (14). The effects of local shielding, when used, would also be extremely difficult to predict accurately. Field measurements with a phantom would no doubt be subject to many errors also, but they appear the best hope for getting a more nearly accurate estimate of gonadal exposure.

## Summary and Conclusions

1. The Oregon survey included approximately 25 percent of all users of diagnostic X-ray units in the State. Little geographic variation was found in regard to patient or personnel radiation exposures.

2. Radiologists and hospitals in which the

that they "harden" the X-ray beam and reduce the skin dose relative to the exit dose. The usual exit dose for ordinary radiography is in the order of 25 to 50 mr, indicating that most of the radiation is absorbed by the body. Use of 85 kilovolts and 3.0 mm. of aluminum filter reduces the skin dose to about 12 percent of that received at 60 kilovolts without a filter. The depth dose changes less because of the filtration effect of the preceding soft tissues themselves, but nonetheless decreases as much as 50 percent. Addition of fast film and fast cassette screens to the above results in a drop to about 5 percent of the original dose at the skin and about 25 percent of the original dose at the approximate depth of the ovaries. If faulty development was also present initially, the reduction by improved film processing is to about 3 percent and 14 percent respectively. These reductions in exposure do not decrease film quality; in fact, there is usually an improvement. For the scrotum, in an A-P view, the decrease in gonadal dose approaches that in air dose, because of the relative absence of intervening tissue.

The effect of coning is not considered in table 3 because collimation of any sort would not adequately protect the gonads during a pelvic X-ray examination. Local shielding, however, may be of help if used properly. In general, exclusion of the gonads from the direct beam will decrease gonadal exposure by at least 90 percent and often even more (14). Therefore, coning and local shielding are of critical importance and heavy stress should be placed on them in control work.

### Genetic Exposure

To appraise fully the steps advisable to protect patients from genetic damage, it is necessary to know their age and reproduction probabilities. It is also necessary to know what classes of practitioners are making the radiation exposures. Such information is not presently available, though many carefully conceived approximations have been made (10, 15, 16). Since reproduction is generally considered to be 50 percent complete by about 30 years and 90 percent complete by about 40 years, the genetic exposures of healthy individuals should

be carefully considered up to age 40, rather than 30.

In general, available data indicate that a small percentage of examinations, those of the lower trunk, contribute the great majority of gonadal exposures. For example, in a study of the entire population of Oak Ridge (17) it has been reported that 5 percent of all examinations contributed 80 percent of exposure to the gonads. The most significant procedures include views of the hips, pelvis, lower spine and sacrum, large bowel, genitourinary system, and full spine. In the Oak Ridge study, chest X-rays constituted 80 to 85 percent of all X-rays but contributed only about 17 percent to the total gonadal exposure. All the remaining views made up the small remaining percentage of examinations. The study did not evaluate pediatric X-rays or X-rays in chiropractic offices, nor give full breakdown by age, but nonetheless it is probably representative.

### Somatic Exposure

It is very difficult to appraise the potential somatic hazards of radiation exposure at the present time. Integral body dose computations are more precise in some respects, but are critically dependent on the tissue exposed. Much recent literature evaluates gonadal and integral bone marrow doses as the two most important general criteria for probable biological damage (16). It may be noted that trunk X-rays or fluoroscopies which irradiate the gonads also tend to give heavy (though local) bone marrow doses.

At present there is inadequate information on the percentage of these critical examinations done on patients in various age categories. The available information suggests that their frequency is at least 2 to 3 times higher in those over 30 years than among younger persons.

### Recommendations

On the basis of the above findings we advocate the following approach. Primary attention should be focused on all pediatric fluoroscopy and childhood X-rays involving the trunk, chest X-rays of all types, X-rays of the lower trunk region in individuals under 40 or

# New Jersey's Action Program to Prevent Poliomyelitis

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NEW JERSEY experienced a relatively high incidence of paralytic poliomyelitis during 1958. There were 266 cases of illness and 10 deaths due to the infection reported to the State department of health (1). The number of paralytic cases increased more than six-fold, from 29 in 1957 to 186 in 1958. One hundred and nineteen of the paralytic cases were confirmed by laboratory isolation of poliomyelitis virus. Among those affected by paralytic poliomyelitis, 35 percent were under 5 years of age. Another 21 percent were 5 through 9 years of age. Less than 10 percent of all persons with paralytic disease had received three inoculations of Salk vaccine.

## Planning

In January 1959 representatives of state-wide medical, health, nursing, educational, and parent-teacher organizations met to consider means of achieving widespread poliomyelitis immunization among those groups who lacked the protection provided by poliomyelitis vaccine.

At the meeting it was reported that the Medical Society of New Jersey was considering a resolution urging all of its component county medical societies to encourage local boards of

education and other educational systems to require poliomyelitis immunization as a prerequisite for admission to school.

A number of representatives stated that there would be little purpose in stimulating demand for immunization unless facilities and vaccine were available to provide the immunizations.

Representatives of the National Foundation reported that when a public clinic is conducted, the general demand for immunization rises. The fact that children are being vaccinated in one situation influences many parents to seek poliomyelitis immunization for their children from family physicians.

Representatives at the meeting endorsed four proposals:

1. The Medical Society of New Jersey resolution encouraging poliomyelitis immunization as a prerequisite for admission to school.
2. Cooperative surveys to determine the status of poliomyelitis immunization, particularly in low socioeconomic groups.
3. Aggressive poliomyelitis immunization programs planned cooperatively by health departments, medical societies, and community agencies.

4. Expansion of existing local health department immunization programs in areas of medical indigency.

A second meeting was held in February 1959 to consider a plan to survey the poliomyelitis immunization status of persons in selected New Jersey communities. The proposed plan was designed to define local problems clearly so that positive action would be taken to immunize as many members of susceptible groups as possible

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X-ray work is under the direction of radiologists had much higher scores than most other groups surveyed on a majority of the items pertinent to radiological protection.

3. Personnel exposure appears to be fairly well under control though film badges should be used much more widely for documentation of exposure.

4. Patient exposure can be reduced by a number of techniques, all of which should be considered. However, on the basis of the experience in Oregon, and considering practical field problems, we recommend that control measures be listed in the following order: (a) coning, (b) added filtration, (c) full-film processing, (d) fast film, (e) local shielding, (f) fast-intensifying screens, and (g) higher kilovoltage technique. In most instances, collimation should be combined with local shielding, which is essential to obtain gonadal protection in most abdominal and pelvic shots.

5. Existing data reveal that only a certain few X-ray examinations contribute most of the gonadal doses.

6. Because of the large radiation doses associated with such procedures as spinograms, well-baby fluoroscopy, and routine pelvimetry, such exposures should be curtailed.

7. Our experience suggests that the successful application of the cited techniques on a wide scale will reduce population gonadal exposure to one-half and perhaps to as little as one-fifth of present exposure. There is no question that this will be a long, complex effort requiring much educational activity as well as further improvements in the technical aspects of X-ray work.

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preceding summer and fall. A door-to-door survey to reach more than 7,000 families totaling approximately 28,000 persons in 12 housing projects was proposed. Techniques were planned to record all persons who were still in need of immunization and to persuade them to attend scheduled immunization clinics.

Starting in April, personnel of the city's bureau of communicable disease control visited 4,815 families, 2,520 distributed among all socioeconomic levels of the city and 2,295 in low-income housing projects. As a result, a total of 7,692 persons through 18 years of age either had or obtained a complete series of Salk vaccine injections. In midsummer more than 2,000 persons in these families still had received no Salk vaccine.

From April, when the survey started, through December, 83,818 cc. of vaccine were administered in the concurrent immunization program of the Newark Division of Health.

#### **Jersey City**

An immunization survey, undertaken in Jersey City in 1958, revealed that approximately 50 percent of children in the age group 5 through 14 years had not received Salk vaccine. It further revealed a remarkably low level of poliomyelitis immunization in adults. During and following the 1958 epidemic, demand for poliomyelitis immunization increased so that by the end of 1958 more than 12,000 inoculations had been given in city child health conferences.

When city health officials were approached in 1959 concerning a new study of immunization in Jersey City, there was an immediate affirmative response. The health department decided to survey seven low-income and one middle-income housing projects.

In a survey of 2,860 persons, principally in low socioeconomic areas, it was found that only 32 percent had completed a series of Salk inoculations. Increased immunization activity resulted, and more than 11,000 inoculations were given through the middle of July 1959.

#### **Elizabeth**

In April 1959 the Elizabeth Health Department initiated action to determine the protection level against poliomyelitis and to pinpoint

those groups in the population which had not been reached. Representatives of the Union County Medical Society, Tuberculosis and Health League, National Foundation chapter, council of parents and teachers, and representatives of the public schools were concerned that surveys in other parts of the country had demonstrated there were many unvaccinated persons in lower socioeconomic groups. The survey committee selected for intensive study a definite geographic area containing approximately 45 percent of the city's population, including the low socioeconomic groups and the medically indigent. Selection was based on 1950 census tract information, a planning board report, and a communicable disease control spot map. It was decided the survey would be limited to a study of the poliomyelitis immunization records of the 12 public elementary and junior high schools, 10 parochial schools, and 6 "baby keep well stations" located in the selected area.

Study of school immunization records showed a direct correlation between the percentages of students with less than three injections and low-income areas. In high-income sections, with a total school enrollment of more than 4,300 students, 76 percent had received at least one injection. In the low-income sections, with enrollment of about 6,000 students, only 59 percent had received at least one inoculation. In view of these findings, it was readily agreed that an intensified vaccination program be established.

A group of approximately 100 volunteers contacted approximately 1,500 families whose members included approximately 2,200 children under the age of 5 years. The immunization campaign reached 1,681 children who received a series of two injections and 220 children who were given their third injection.

A total of 3,012 inoculations were given in the public schools and 1,096 inoculations in the parochial schools. Immunization records indicate that 83 percent of students in the parochial schools are now triply vaccinated (2).

#### **Paterson**

When a poliomyelitis immunization survey was proposed in Paterson, it was learned that

prior to the 1959 poliomyelitis season. It stated that local health departments would be responsible for immunization programs in areas where studies revealed incomplete immunization associated with medical indigency, and that the State department of health would provide vaccine for the medically indigent within the limitations imposed on the department by law.

Surveys were suggested for Newark, Jersey City, Paterson, Elizabeth, Bayonne, Hoboken, Trenton, Camden, and Atlantic City because in these cities a significant proportion of the population fell in the low socioeconomic group. Several of the cities had a high incidence of paralytic poliomyelitis during 1958.

It was recommended that the need for and methods of survey be discussed with the representatives of the local medical societies and with the local health officials of the cities under consideration.

### Completed Plan

In a subsequent meeting representatives of the State department of health and the Medical Society of New Jersey considered the survey procedures and agreed on the following actions:

- Local health departments in cooperation with appropriate county medical societies determine areas of incomplete immunization associated with low socioeconomic status and medical indigency.
- Local health departments establish and medical societies assist in staffing facilities for administering poliomyelitis immunization to nonimmunized persons up to 20 years of age.
- The services of the immunization facilities be limited solely to residents of those areas defined as medically indigent by the health department and the medical society.
- Persons living in the defined areas be persuaded to utilize immunization services through organized community effort.

### Local Action

District State health officers met with local medical societies to discuss the background, planning, and technique of the poliomyelitis immunization survey. Immediate cooperation was assured by the county medical societies.

The surveys were then discussed with the

local health officers. Planning meetings were held in each community to determine a course of action. The methods and results which follow reflect the ingenuity, initiative, and ability of the health professions in New Jersey to tailor action to meet specific needs.

### Newark

During the 1958 New Jersey epidemic Newark experienced an unusual incidence of 43 paralytic cases. The Newark Division of Health in cooperation with the State department of health and the Communicable Disease Center of the Public Health Service undertook to determine the extent to which selected persons living in Newark had been immunized against poliomyelitis. In a most unusual response during the outbreak in mid-August the nurses of the bureau of child health and the Visiting Nurse Association conducted in 1 week a survey covering more than 8,000 persons. At that time, approximately 30 percent of children between 5 and 14 years and 50 percent of children under 5 years of age had not received Salk vaccine.

An intensive campaign was initiated, reaching every area of the community, so that by the end of 1958 more than 50,000 inoculations had been given in public and parochial schools, at city "baby keep well stations," in the division of health clinics, and in adult clinics throughout the city.

Inspectors of the Newark Division of Health visited approximately 3,500 families in the latter part of 1958. They surveyed all persons under 19 years to determine how many had been inoculated and the number of injections they had received. Those with no protection or with an incomplete series of inoculations were urged to obtain immunization. They were referred to private physicians, clinics, or the city's division of health.

Early in January 1959 the Newark Board of Education adopted a resolution that every pupil newly enrolled after January 31 of that year be required to have received at least one inoculation against poliomyelitis as a prerequisite of attendance at school.

When the plan for survey was presented to the Newark Division of Health in the spring of 1959, Newark elected to use the method of the

first grade students, and is probably lower than the actual number.

### Other Cities

Sampling surveys were undertaken in Hoboken, Bayonne, Trenton, Camden, and Atlantic City. While the organizations conducting the surveys varied, nevertheless there was a relative uniformity in technique. In each area, persons familiar with the local characteristics assisted in the definition of areas of high, middle, and low socioeconomic status.

The Hoboken Health Department nursing staff planned and conducted the survey under the guidance of the health officer and personnel of the State department of health.

In Camden, city health department nurses and other personnel of the department carried out the survey.

In Bayonne, the Visiting Nurse Association, under the guidance of its nursing director, sampled the community's immunization status.

In Trenton, a citizens' health committee fostered the survey and subsequent immunization campaign.

Finally, in Atlantic City volunteers of the National Foundation made the survey possible.

The results of sampling surveys in selected cities are presented in table 1. Information was obtained on a total of 7,279 persons. The sample is heavily weighted by persons in the middle and lower socioeconomic groups. Only 524 persons were sampled in the upper socioeconomic group. In the entire sample, approximately 43 percent of persons in the middle

socioeconomic group and 53 percent of persons in the lower socioeconomic group have had no Salk vaccine. Approximately 37 percent of the middle group and 26 percent of the lower socioeconomic group had completed the basic series of three inoculations.

Table 2 indicates the percentage of persons in the samples having three inoculations by age group, in the selected cities and Jersey City. This table is biased in the direction of the middle and low socioeconomic groups.

Generally, approximately 50 percent of the population sampled in the 5-14 age group has been completely protected. Only 28 percent of children under 5 years and 20 percent of persons between the ages of 15 and 39 have been completely protected. The highest levels of complete protection were found in Atlantic City and Trenton in the 5 to 14 age group.

While these figures are selective and contain bias, nevertheless, they serve to reveal quite dramatically conditions existing in the spring of 1959 in New Jersey. They highlight the continuing need for complete protection in the 5 to 14 age group and emphasize the need for starting and completing the series of inoculations for children under 5 years.

### Effects of Surveys

Conducting the surveys, the survey findings, newspaper publicity, the activity of professional organizations, visiting of homes, and the neighborhood impact served to stimulate widespread immunization. Cities surrounding major sampling areas undertook surveys of their own (3,4). This multiplying effect was antici-

**Table 2. Percent of persons triply inoculated, poliomyelitis immunization surveys of selected New Jersey cities, 1959**

Age group (years)	All cities			Atlantic City	Bayonne	Camden	Hoboken	Jersey City	Trenton
	Number surveyed	Number with three inoculations	Percent with three inoculations						
Total	10,139	3,464	34.2	62.7	30.2	28.6	37.0	32.0	43.0
Under 5	2,809	799	28.4	48.1	31.0	28.3	20.6	21.4	39.6
5-14	3,862	1,975	51.1	85.7	60.0	49.0	66.5	40.0	71.7
15-39	3,468	690	19.9	49.0	16.7	13.9	27.0	18.9	25.7

the Passaic County Medical Society, together with the Passaic County Chapter of the National Foundation, had initiated a county poliomyelitis vaccine committee in 1957. The committee comprised representatives of labor, industry, health, pharmacy, education, and the main religious groups. In the spring of 1959, recommendations of the Public Health Service that immunization programs throughout the United States be stepped up stimulated the committee to action.

When the State department of health suggested a census of the children who had not been immunized, the local director of the civil defense organization offered the services of his group to canvass the county. The canvass gathered information concerning poliomyelitis immunization and data for civil defense and disaster control. This technique provided a great stimulus stirring thousands of persons to action.

More than 20,000 poliomyelitis vaccine inoculations were given. Eighty percent were first or second doses because beginning inoculations were emphasized.

Cooperating in the campaign were more than 130 doctors who volunteered their services, the boards of health in 16 municipalities who assisted, and the county's hospitals where ap-

proximately one-fifth of the inoculations were given. The local civil defense organization, in assuming a new function, set a precedent in community preventive action.

### Northern State Health District

The Northern State Health District, consisting of Hunterdon, Morris, Somerset, Sussex, and Warren Counties, undertook a survey of general immunization requirements in the school districts of the five counties and the poliomyelitis immunization status of children enrolling for school in September 1959.

This survey included 119 municipalities in an area that is predominantly rural but is spotted with growing urban and suburban areas. Although 115 municipalities required smallpox vaccination for admission, only 31 required one or more inoculations of poliomyelitis vaccine.

Ninety-seven percent of the 11,168 students scheduled to enter school in September had complied with the smallpox requirement in July. School records on poliomyelitis immunization were incomplete because it was not a prerequisite for admission to school. However, 5,142 children were recorded as meeting poliomyelitis immunization requirements. This accounts for 54 percent of the entering

**Table 1. Percent of persons through 39 years of age, uninoculated or triply inoculated, by socioeconomic group, poliomyelitis immunization surveys of selected New Jersey cities, 1959**

City	Socioeconomic groups <sup>1</sup>											
	Total			Upper			Middle			Lower		
	Total number	Uninoculated	Three inoculations	Total number	Uninoculated	Three inoculations	Total number	Uninoculated	Three inoculations	Total number	Uninoculated	Three inoculations
Total	7, 279	45. 0	36. 3	524	20. 0	67. 0	3, 976	43. 4	37. 5	2, 779	52. 5	26. 0
Atlantic City	451	28. 3	62. 7	67	12. 0	77. 6	295	28. 1	62. 0	89	43. 8	53. 0
Bayonne	684	48. 4	30. 2	13	54. 0	23. 1	358	47. 2	34. 2	313	49. 6	25. 9
Camden	3, 804	49. 5	28. 6	77	37. 7	53. 4	2, 228	47. 2	31. 2	1, 499	53. 5	23. 4
Hoboken	589	35. 0	37. 0	63	28. 6	55. 5	222	25. 1	51. 7	304	55. 0	22. 4
Trenton	1, 751	40. 2	43. 0	304	13. 8	72. 0	873	42. 0	43. 0	574	52. 0	29. 7

<sup>1</sup> Households were assigned to a socioeconomic group on the basis of number of persons per room and the educational level of the head of the household. Households were scored as follows: 2 points for 0.74 persons per room, 1 for 0.75-1.24, and 0 for 1.25 or more; 2 points for 1 year of college or more or other formal training after high school, 1 for 7-12 grades, and 0 for 6 grades or less. A combined score of 4 points equaled the upper group, 3 or 2 points, middle group, and 1 or 0, the lower group.

# Group Attitudes and Information Sources in a Poliovaccine Program

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MUCH recent attention has been focused on public acceptance of the Salk poliomyelitis vaccine program (1-6). Part of this interest is the result of the unique nature of the program itself—a major experiment involving the people of an entire Nation as both subjects and interested observers. The confusion and controversy which marked several stages of the program have also added interest. But a large measure of its public health importance results from its value in planning other health programs. If modern medical science can provide the requisites for disease control, and if health administrators design mass programs, then the remaining variable of public opinion and acceptance is all that stands in the way of success. We may learn from the Salk vaccine experience which segments of the population were not reached and why and, most important for the future, how they may be reached.

In implementing health improvement programs, the health officer generally takes for granted that varying degrees of support will be found among the public health population and that there are "unreachable" segments.

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Usually there is no attempt to reach specific groups; a mass approach is used in the hope of reaching as many people as possible. Various media of communication are used to disseminate information about the value of particular health measures, and it is fondly hoped that the result of such an educational effort will be general acceptance. If, however, it is known in advance which segments of the population are most resistant, and which media of information is the most successful in reaching them, a more comprehensive and direct approach would be possible.

This paper presents data concerning the relative importance of various media of communications in the formation of attitudes regarding vaccination for poliomyelitis among various social groups in two counties in New York. The data are drawn from a larger home interview study of two New York State counties in the spring and summer of 1957. A previous paper presented the findings of parts of the study dealing with vaccination levels by age, sex, social class, and education (7).

## The Study Design

The methodology for the study, described in the earlier paper, was based on the home interviews in area probability samples in each of two counties. These were Rensselaer County, semirural, with one large and one small city, and Westchester, urban and suburban, adjoining New York City.

A random sample of subareas designed to yield 1,000 households was selected in each

pated and contributed to wider immunization than could be expected from the individual surveys.

### Use of Salk Vaccine

Two gauges may be used to measure the use of Salk vaccine within the State, the records of shipments from manufacturers to commercial and public agencies and the records of the State department of health biological distributing stations.

Between January 1 and December 25, 1959, a total of 1,785,000 cc. were shipped to the State, 1,113,000 cc. to commercial outlets and 672,000 cc. to public agencies. Vaccine was in short supply during July and August.

Records of the biological distributing stations indicate that the total of 555,760 cc. issued in 1959 exceeds by 180,000 cc. issues made in 1958. At the height of survey activity in May and June 1959 nearly 200,000 cc. were issued.

### Future Activity

The results of the surveys conducted in the spring of 1959 indicate need for continuing programs to improve the poliomyelitis immunization status of the population.

Two types of activity are planned: a broad survey of immunization status of pupils to be carried out by boards of education, and surveys by boards of health of the immunization status of children through 2 years of age.

The school survey is designed to determine if school districts and parochial schools require poliomyelitis immunization. Selected schools will then be sampled to determine the completeness of the students' poliomyelitis immunization. These studies are to be followed by activities designed to stimulate immunization of all students who are incompletely protected.

The studies by boards of health are proposed to determine the immunization status of the younger children. This will provide an opportunity to explain the need for complete immunization to parents.

### Summary

In 1958 New Jersey experienced an outbreak of poliomyelitis in which 90 percent of persons with paralytic disease had not received Salk vaccine. Preliminary surveys in 1958 indicated that a substantial portion of the population of several cities had not received three inoculations of Salk vaccine.

A survey and immunization plan was developed for cooperative action by the health departments, medical societies, and voluntary agencies. Surveys were carried out in one State health district, one county, and nine large cities of the State. Several methodologies were used with equally good effects.

A direct relationship was found between the degree of immunization and socioeconomic status. The higher the socioeconomic status, the more nearly complete the immunization. A need for starting and completing immunization of large numbers of persons through 18 years of age was revealed.

Surveys were followed by increased numbers of immunization programs and broader coverage of persons, and more vaccine was used throughout the State.

Future action includes immunization surveys by boards of education and boards of health and increased immunization activity.

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**Table 1. Sources of information on poliomyelitis vaccine of persons classified by social position scores, Rensselaer County, N.Y.—Continued**

Social position class <sup>1</sup>	Source of information						Total number
	Magazine		Health department		Pamphlet		
	Number	Percent	Number	Percent	Number	Percent	
Total.....	249	26. 8	254	27. 3	87	9. 4	930
I.....	21	47. 7	16	36. 4	8	18. 2	44
II.....	18	34. 6	18	34. 6	5	9. 6	52
III.....	57	28. 1	73	36. 0	34	16. 7	203
IV.....	84	25. 7	82	25. 1	20	6. 1	327
V.....	60	26. 3	56	24. 6	14	6. 1	228
Unscored.....	9	11. 8	9	11. 8	6	7. 9	76

<sup>1</sup> According to the Hollingshead two-factor index of social position.

best reached through some sort of personal contact. Our data, however, do not support this contention, particularly in the more rural county of Rensselaer.

As part of the schedule of questions, each respondent was asked if he or she had received any information concerning the poliomyelitis vaccine program from certain specified sources of information which included both mass media of communication and personal contacts. Personal contact sources, such as husbands, wives, and friends, appeared to be the least frequent sources of information. In Rensselaer County, for example, only 20.2 percent of all respondents reported information of any degree of importance from husbands, 5.9 percent from wives, 21.8 percent from children, 29.2 percent

from friends and neighbors, 8.0 percent from other household members, and 4.1 percent from other persons. Similarly, in Westchester County 14.4 percent reported information from husbands, 3.4 percent from wives, 10.4 percent from children, 28.5 percent from friends and neighbors, 2.6 percent from other household members, and 1.2 percent from other persons.

One source of personal approach reported very frequently was the physician: 37.5 percent of the respondents in Rensselaer County and 44.9 percent of the respondents in Westchester County reported having received information from this source (tables 1 and 2). Since it seems to be specifically the lower economic and social classes who need to be reached we were interested in finding out the general

**Table 2. Sources of information on poliomyelitis vaccine of persons classified by social position scores, Westchester County, N.Y.—Continued**

Social position class <sup>1</sup>	Source of information						Total number
	Magazine		Health department		Pamphlet		
	Number	Percent	Number	Percent	Number	Percent	
Total	217	24. 0	94	10. 4	50	5. 5	904
I. ....	44	33. 3	14	10. 6	11	8. 3	132
II. ....	31	24. 6	10	7. 9	7	5. 6	126
III. ....	64	24. 7	22	8. 5	13	5. 0	259
IV. ....	60	26. 5	34	15. 0	12	5. 3	226
V. ....	14	12. 6	10	9. 0	5	4. 5	111
Unscored	4	8. 0	4	8. 0	2	4. 0	50

<sup>1</sup> According to the Hollingshead two-factor index of social position.



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Social position class <sup>1</sup>	Source of information									
	Newspaper		Television		Physician		Radio		School	
	Number	Percent	Number	Percent	Number	Percent	Number	Percent	Number	Percent
Total	710	76.3	595	64.0	349	37.5	560	60.2	303	32.6
I	36	81.8	23	52.3	30	68.2	25	56.8	23	52.3
II	45	86.5	38	73.1	18	34.6	33	63.5	19	36.5
III	166	81.8	144	70.9	100	49.3	135	66.5	78	38.4
IV	255	78.0	206	63.0	125	38.2	194	59.3	108	33.0
V	159	69.7	157	68.9	71	31.1	139	31.0	71	31.1
Unscored	49	64.5	27	35.5	5	6.6	34	44.7	4	5.3

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county, and interviewing began in April 1957 and continued through May of that year. The schedule of questions aimed at obtaining information on the poliomyelitis vaccination history of each member of the household, sociocultural characteristics, opinions as to why individual members of the household and certain other population groups had or had not been vaccinated, and the effects of various media of communication on the decision regarding vaccination.

In all, 930 households representing 3,095 persons were interviewed in Rensselaer County and 904 households with a total of 3,305 persons, in Westchester. Following the interviews, in a comparison of known demographic characteristics of the sample population with those of

the general population, we found a close similarity in household size, sex distribution, and age and educational structure.

### Findings

Different population groups are differentially exposed to informational media. The recent summary of research sources of information on the vaccine program made by Rosenstock and his associates concludes further that the majority of these studies indicate that they will have to be reached through personal contact rather than through the mass media (6). While not negating the value of the mass media in such a program, the summary article does give the impression that the hard-to-reach groups are

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Social position class <sup>1</sup>	Source of information									
	Newspaper		Television		Physician		Radio		School	
	Number	Percent	Number	Percent	Number	Percent	Number	Percent	Number	Percent
Total	651	72.0	563	62.3	406	44.9	353	39.0	239	26.4
I	109	82.6	111	84.1	78	59.1	58	43.9	38	28.8
II	103	81.7	110	87.3	60	47.6	50	39.7	48	38.1
III	204	78.8	200	77.2	139	53.7	108	41.7	75	29.0
IV	154	68.1	104	46.0	91	40.3	93	41.2	53	23.5
V	52	46.8	38	34.2	29	26.1	26	23.4	19	17.1
Unscored	29	58.0	0	0.0	9	18.0	18	36.0	6	12.0

<sup>1</sup> According to the Hollingshead two-factor index of social position.

**Table 1. Sources of information on poliomyelitis vaccine of persons classified by social position scores, Rensselaer County, N.Y.—Continued**

Social position class <sup>1</sup>	Source of information						Total number
	Magazine		Health department		Pamphlet		
	Number	Percent	Number	Percent	Number	Percent	
Total.....	249	26. 8	254	27. 3	87	9. 4	930
I.....	21	47. 7	16	36. 4	8	18. 2	44
II.....	18	34. 6	18	34. 6	5	9. 6	52
III.....	57	28. 1	73	36. 0	34	16. 7	203
IV.....	84	25. 7	82	25. 1	20	6. 1	327
V.....	60	26. 3	56	24. 6	14	6. 1	228
Unscored.....	9	11. 8	9	11. 8	6	7. 9	76

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In all, 930 households representing 3,095 persons were interviewed in Rensselaer County and 904 households with a total of 3,305 persons, in Westchester. Following the interviews, in a comparison of known demographic characteristics of the sample population with those of

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II.....	103	81.7	110	87.3	60	47.6	50	39.7	48	38.1
III.....	204	78.8	200	77.2	139	53.7	108	41.7	75	29.0
IV.....	154	68.1	104	46.0	91	40.3	93	41.2	53	23.5
V.....	52	46.8	38	34.2	29	26.1	26	23.4	19	17.1
Unscored.....	29	58.0	0	0.0	9	18.0	18	36.0	6	12.0

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**Table 3. Opinions as to whether the Government should provide free vaccine to children, expressed by respondents in Rensselaer County, N.Y., classified by social position score**

Social position class <sup>1</sup>	Total number	Government should		Government should in need only		Government should not		Undecided and no opinion	
		Number	Percent	Number	Percent	Number	Percent	Number	Percent
Total.....	930	750	80.6	112	12.0	16	1.7	52	5.6
I.....	44	31	70.5	7	15.9	3	6.8	3	6.8
II.....	52	41	78.8	7	13.5	3	5.8	1	1.9
III.....	203	174	85.7	18	8.9	2	1.0	9	4.4
IV.....	327	267	81.7	37	11.3	5	1.5	18	5.5
V.....	228	184	80.7	31	13.6	1	.4	12	5.3
Unknown.....	76	53	69.7	12	15.8	2	2.6	9	11.8

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producing a favorable decision toward vaccination, but once again it is the "hard-to-reach" lower class groups who least commonly come in contact with physicians, and they must receive information in order to make a favorable decision.

A second important finding is that with the possible exception of radio and, to a lesser extent, television, the mass media are more commonly cited as sources of information with increase in social class position. The mass media appear by far the most common and reliable means of reaching the largest proportion of all social classes.

Finally, and perhaps most important of all, it appears that the mass media of communication are more commonly cited, particularly in

the "hard-to-reach" lower classes in the semi-rural county of Rensselaer than in the more urban Westchester. Newspaper, television, and radio information reached a significantly higher proportion of the lowest two classes in Rensselaer than was reported in Westchester. This is also true when the samples are considered as totalities. In each case, the upstate, largely rural respondents from Rensselaer reported information from newspapers, television, radio, and even magazines more frequently than did the more urbanized Westchesterites.

In assessing the relative value of various media of communication, then, it might be hypothesized that in rural areas, where contact with physicians is less frequent and where the lower population density places greater re-

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Social position class <sup>1</sup>	Total number	Government should		Government should in need only		Government should not		Undecided and no opinion	
		Number	Percent	Number	Percent	Number	Percent	Number	Percent
Total.....	904	589	65.2	178	19.7	72	8.0	65	7.2
I.....	132	74	56.1	34	25.8	15	11.4	9	6.8
II.....	126	72	57.1	26	20.6	18	14.3	10	7.9
III.....	259	162	62.5	49	18.9	22	8.5	26	10.0
IV.....	226	170	75.2	38	16.8	9	4.0	9	4.0
V.....	111	79	71.2	22	19.8	2	1.8	8	7.2
Unknown.....	50	32	64.0	9	18.0	6	12.0	3	6.0

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social class distribution of the respondents who reported information from physicians.

The respondents had been previously classified in socioeconomic and educational status groups by use of the Hollingshead two-factor index of social position, a scale using occupation and education weighted individually and then combined to give an "index of social position score" (8). Each member of a household was assigned to one of five social position classes, based upon the index score of the chief wage earner of the household. The social class position of the respondents who reported information of some degree of importance from physicians is presented as part of tables 1 and 2.

As these tables indicate, the higher social position classes more frequently report physicians as sources of information. The percentage of respondents reporting information from physicians in Rensselaer County as a whole is significantly lower than in Westchester County, which has a generally higher socioeconomic grouping. This suggests that the only source of personal approach at all effective in reaching the population in the poliomyelitis vaccine program is the physician, and that even here the amount of information received was not nearly so great among the lower socioeconomic and educational groups who are the "hard-to-reach" segments of the population for whom the personal approach is recommended.

Our data also reveal the continuing efficacy of the conventional mass media of communication in reaching, if not persuading, members of all classes. Communications research has indicated that lower social groups tend to read newspapers, and also to read items of educational, scientific, and health affairs within newspapers, less frequently than the higher groups (9). Our data support this conclusion, and in both counties, newspapers as sources of information decrease with social class position (tables 1 and 2). But even in the lowest social class the newspaper is still the most frequently cited medium of information. Almost 70 percent of the respondents in Rensselaer and 47 percent in Westchester in this class named this source.

Television, the second most frequently cited information medium, decreases in importance steadily and significantly as social class posi-

tion decreases in urban Westchester County. The percentage of class V respondents naming this source was less than half of that in class I. In rural Rensselaer County, however, no decrease is shown.

Again, our data seem to confirm the finding of earlier studies of communications that social classes differ little in exposure to radio. There is little difference from class to class in either county except in the lowest class in Westchester County, which cites this source relatively seldom. The lowest class in Rensselaer reports radio as a source about as often as the other classes and, indeed, more frequently than class I. The most interesting fact relating to radio is the much higher percentage reporting this source in Rensselaer County (60.2 percent) than in Westchester County (39.0 percent).

As might be expected, the magazine as an information medium is much more common in the upper social class groups. The percentage of respondents in Rensselaer who reported information from the health department was almost three times as great as in Westchester, and a higher proportion also cited a school as a source.

Our data indicate that in the two counties pamphlets, such as those distributed by the National Foundation, were a negligible factor, having been most frequently cited by the higher social position classes which already had a high rate of exposure to other sources.

All of these data throw some light on the comparative value of the mass media and "personal" contact in the vaccine program. First, with the exception of the physician, personal contact played little or no role in disseminating information about the program. It might be argued that while personal contact was not extensive as a source, it was more effective than the mass media approach where it did take place. In a separate question we asked our respondents what was the most important source of information figuring in decisions to be vaccinated. Once again the mass media were much more commonly listed. As a matter of fact, the newspaper was listed more frequently than the physician in both counties, and in Rensselaer County, television was listed as often as the physician. Certainly physicians as health authorities are important in

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		Number	Percent	Number	Percent	Number	Percent	Number	Percent
Total.....	904	589	65.2	178	19.7	72	8.0	65	7.2
I.....	132	74	56.1	34	25.8	15	11.4	9	6.8
II.....	126	72	57.1	26	20.6	18	14.3	10	7.9
III.....	259	162	62.5	49	18.9	22	8.5	26	10.0
IV.....	226	170	75.2	38	16.8	9	4.0	9	4.0
V.....	111	79	71.2	22	19.8	2	1.8	8	7.2
Unknown.....	50	32	64.0	9	18.0	6	12.0	3	6.0

<sup>1</sup> According to the Hollingshead two-factor index of social position.

liance on the mass media for information, the traditional sources of information are still the most valuable. In promoting health education, then, it is most important to know the cultural milieu of the area.

An earlier article describing some of the attitudes expressed by respondents on such questions as why people have or have not been vaccinated, shows important differences between our two dissimilar counties. Some additional data we have processed by social class position again indicate differences among both social classes and rural-urban locality. One of the questions we asked was whether the respondent felt that the Government should or should not provide free vaccine for school-age children. As we expected, the lower middle groups expressed the highest degree of favor toward free vaccine (tables 3 and 4). We had expected, however, that the more urban Westchesterites would express the more "liberal" attitudes toward Government aid while the conservative country dwellers would oppose it. Just the opposite was true. While it was still very small, the proportion of respondents in Westchester County opposing Government-supplied vaccine was four times as great as in Rensselaer. This is even more surprising in view of the fact that the proportion of people vaccinated was higher in Westchester than in Rensselaer. There are many possible explanations for this, including need or political orientation, but it does indicate that regional and rural-urban factors do have a bearing in the formation of attitudes concerning vaccination.

## Discussion

At first glance, our findings appear to be at variance with the growing belief that personal contact best reaches the lower income family with little formal education. Our data indicate that the mass media are still the most effective means of reaching the public. We agree, however, that personal contact, particularly with a physician or other health figure, is probably the most effective means of persuading individuals to be vaccinated once they have been reached. While Rensselaer County had a higher rate of reported information from mass media, it was lower than Westchester in

reported information from physicians and had a lower rate of vaccination in all social classes. The problem of the vaccine program would seem to be one of motivation rather than of sheer exposure to media.

Exposure to information sources was high in all social classes. But exposure is not enough. The individual's decision as to whether or not to be vaccinated is related to such factors as health attitudes and attitudes toward science. The remaining factor is motivation, for the individual must be convinced that vaccination is a step important enough to overcome the many adverse factors tending to hold him back from seeking vaccination. Getting the information to him is merely an avenue of approach, the important problem is how to convince him—once we have gotten to him—that he should be vaccinated. We agree that personal contacts would probably be the most effective means but even this presents problems. First, we must ask: "personal contact with whom?" The most common contacts are with family, relatives, neighbors, and work associates, and our data suggest that they are poor sources of information. Even if they were excellent sources there is the question of level of information. Each "layman" who becomes a source of information must be educated as to the benefits of vaccination from some previous source. The answer would seem to rest with the private physician in his contact with patients, but the individuals who are most resistant to vaccination are the ones least likely to come in contact with physicians.

The traditional means of communication and dissemination of information still appear to us to be the best methods of getting the information to the public. If our data are indicative of conditions in other areas, particularly rural and semirural, mass media do reach the public, even the lower classes. What is necessary is a new approach in motivating people to seek vaccination; an approach which can be adapted to the existing means of communication.

## Summary and Conclusions

After assigning respondents from an area probability sample in two New York State counties into Hollingshead social position

classes, we have attempted to express the differences in reported exposure to various media transmitting information on the Salk vaccine program among these classes and between the two dissimilar counties. We found that personal contact media were least reported, with the exception of the physician, and citing the physician was most common in the upper social class groupings. The mass media of communication—newspapers, television, radio, and to a lesser extent magazines—were the most commonly reported. These media tended to be more often reported as social class position increased. The mass media were much more often reported as sources in Rensselaer County than in Westchester County, particularly in the lowest social class.

We believe that the findings indicate that the mass media reach the public, even the lower social classes, and are still the best way of getting information to the public. What is needed is a new approach, adaptable to these media, toward motivating individuals to seek vaccination.

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### Laboratory Refresher Training Courses

Refresher training in laboratory methods will be offered at the Communicable Disease Center, Public Health Service, Atlanta, Ga., during the period October 10, 1960, through April 7, 1961, as listed below. Information and application forms can be obtained from the Laboratory Branch, Communicable Disease Center, Public Health Service, Atlanta, Ga.

- |  |   |
|--|---|
| Fundamentals of virology (819). Oct. 10-21.                        | Special problems in medical bacteriology (830). Mar. 20-24.           |
| Diagnosis of tuberculosis (855). Oct. 31-Nov. 11; Jan. 30-Feb. 10. | Enteric bacteriology (850). Mar. 27-Apr. 7.                           |
| Diagnosis of rabies (826). Nov. 28-Dec. 2; Apr. 3-7.               | Courses in the following will be offered by special arrangement only: |
| Bacteriophage typing of staphylococci (856). Dec. 5-9.             | Laboratory methods in the diagnosis of malaria (805).                 |
| Medical mycology (815). Jan. 9-Feb. 3.                             | Special training in virus techniques (821).                           |
| Serologic methods in microbiology (941). Jan. 23-Feb. 10.          | Typing of <i>Corynebacterium diphtheriae</i> (842).                   |
| Study of pulmonary mycoses (817). Feb. 13-24.                      | Special problems in enteric bacteriology (851).                       |
| Medical bacteriology (838). Feb. 27-Mar. 17.                       | Phage typing of <i>Salmonella typhosa</i> (852).                      |
| Veterinary mycology (940). Mar. 6-10.                              | Laboratory methods in the diagnosis of leptospirosis (853).           |
| Diagnosis of viral and rickettsial diseases (820). Mar. 13-31.     | Serologic differentiation of streptococci (854).                      |
|  | Special problems in microbiology (942).                               |



# approach to ZERO for Tuberculosis

## ADDENDUM

H. S. WILLIS, M.D.

A challenge to people in the health professions was voiced in the issue of *Public Health Reports* for February 1960 which carried the gist of the recent Arden House Conference on Tuberculosis. The official report of the conference and the summarizing statement presented well-thought-out material, worthy of full and active endorsement. This is a good report—a document which points to the gains to date against tuberculosis and the weaknesses in the present attack. It suggests ways and means toward elimination, if not eradication, of tuberculosis in this country. It properly stresses the public health features of the disease and points to the importance of protecting the community.

The recommendations which grew out of this conference aim at identifying "some of the deficiencies of current tuberculosis control programs." Hospital treatment is not thought of as a deficiency, hence the lack of emphasis by the conference on this aspect of the attack. The importance of hospitalization, however, appears fully to justify further emphasis at this time and in this connection when attention is being focused on an all-out attack against the disease.

What is now to be said about this report is not in criticism of it for every comment in it is reasonable and every recommendation a sound one which must be put into effect if we are to rout this disease from our midst. But the one factor in the armamentarium against the disease, as referred to above, received rather incidental mention for the reason given. The official report says "infection can be prevented by eliminating active disease," but it refers seldom to isolation as an instrument of control. Isolation is at the heart of home treatment which stands high in its recommendations.

Homes of the well-to-do will readily provide satisfactory arrangements for isolation, sanitation, ventilation, medical care, and dietary needs. Patients treated in such homes do well. But this is not true for the average home, where tuberculosis is discovered most often. As shown in the report, tuberculosis is distributed in a spotty way throughout the country. More often than not excessive tuberculosis coexists in homes with low economic, low educational, and, frequently, high emotional levels. Tuberculosis spreads and prospers where there are overcrowding, underfeeding, and the strains and stresses that are a part of poverty. An adequate setup for full use of the tools of both prevention and therapy is seldom

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found in the impoverished home. Under these conditions, how many homes could create and sustain adequate treatment? In my State, which still has tinges of tuberculosis and poverty, it appears that not more than 10 percent would qualify.

To hold a patient with active disease in an inadequate home for the weeks and, occasionally, months of treatment required to produce negative status, in a home where bacilli and numerous members of the family have close association, is an open invitation to the breeding of new cases and certainly is to seed infection to an unknown number of contacts. Most physicians hold that it requires more than the tubercle bacillus to produce clinical tuberculosis. None, however, would deny that this micro-organism stands in a *sine qua non* relationship—that we would have no tuberculosis without the tubercle bacillus. Preventing spread of infection wherever possible is therefore incumbent upon us.

The Arden House Conference came into being through joint sponsorship of the Public Health Service and the National Tuberculosis Association. At its February 1960 meeting the board of directors of the National Tuberculosis Association deliberated on and fully endorsed the recommendations presented by the conference and has included a reference to hospitalization as an acknowledged instrument of tuberculosis control. Action of this body is as follows (1):

The board of directors endorsed the principal recommendation of the Arden House Conference and the 11 subsequent recommendations. Furthermore, the board directed that:

1. The National Tuberculosis Association exert a maximum effort over the next few years to implement the major recommendation of the Arden House Conference in close collaboration with the U.S. Public Health Service.

2. The National Tuberculosis Association work in cooperation with the Public Health Service to achieve the goals suggested by the other 11 recommendations.

3. Constituent and affiliated tuberculosis associations be urged to take leadership in their areas to implement the Arden House Conference recommendations.

4. The National Tuberculosis Association staff be asked to report to the board of directors 1 year from now on the progress made to implement the major recommendation and the other 11 recommendations.

The Arden House Conference confined its recommendations to certain selected deficiencies of current tuberculosis programs requiring special new emphasis. To avoid any possible misinterpretation that hospital treatment is no longer desirable, the board of directors passed the following additional statement:

Initial hospitalization of all persons with communicable tuberculosis is desired. Continuing hospitalization is desired for all tuberculosis patients where home conditions are not adequate or sanitary. Such hospitalization should not be terminated until after negative status has been achieved.

This note is expression of a wish that this otherwise forward-looking challenge might have mentioned hospitalization not inferentially (though favorably) but had advocated it boldly where needed and had done so as if it were a vital part of the "big push ahead." It is proper to assume that hospitalization is used to a greater or lesser extent by most people concerned with treatment of the tuberculous as a satisfactory public health measure against spread of infection even if not primarily for therapy, but mention in the report of its positive value would have contributed an added thrust to this otherwise helpful document. Continued ignoring of such a mode of treatment could possibly destroy the idea of hospitalization altogether which certainly was not implied in the report and surely not desired by members of the conference.

#### REFERENCE

- (1) Perkins, J. E.: NTA board endorses Arden House recommendations (editorial). *Bull. National Tuberc. A.* 46: 2, April 1960.

## STATEMENT

By Arthur S. Flemming, Secretary of Health,  
Education, and Welfare, April 28, 1960

# Strontium 90 Content of Wheat

The regular quarterly statement on fallout of the Atomic Energy Commission, released April 28, 1960, contains data relating to the strontium 90 content of wheat and wheat products from the 1958 crop in Minnesota, North Dakota, Montana, Illinois, Kansas, Oklahoma, Texas, Michigan, and New York. These data are summarized below:

Material	Strontium 90 ( $\mu\text{mc./kg.}$ )		
	Low	High	Average
Wheat -----	21	133	62
Patent flour-----	3	42	12
1 and 2 clear flour-----	6	86	28
Germ -----	50	191	
Shorts -----	28	665	
Bran -----	52	675	231

NOTE: A curie is a measure of radioactivity equivalent to that produced by 1 gram of radium. A microcurie ( $\mu\text{mc.}$ ) is 1 millionth of a millionth of a curie.

The statement of the Atomic Energy Commission also shows that up to the present time analyses on the 1959 crop have been completed for whole wheat only. These analyses show results similar to those for the 1958 crop.

At my request, the Public Health Service, the Food and Drug Administration, and the Federal Radiation Council have reviewed these data. They have advised me that the strontium 90 intake of the U.S. population from all dietary sources does not constitute a public health hazard warranting any regulatory action at the present time.

The conclusion that the present situation does not call for any regulatory action was based on the following considerations:

The guideline for average daily intake of strontium 90 used by this Department at present is 33 micromicrocuries per liter or kilogram of total dietary intake averaged over a period of

1 year. This value is derived from the recent interim recommendation of the National Committee on Radiation Protection and Measurements that the values suggested by the International Commission on Radiation Protection for planning purposes be accepted. Although this guideline was not developed to serve as a limit for regulatory purposes, it is a conservative basis for evaluating the significance of these data. For general populations the International Commission on Radiation Protection suggested 33 micromicrocuries per liter or kilogram based upon a 50-year exposure, but for operating purposes averaged over periods not to exceed 1 year. This value applies to all groups within the population. In considering the health effects of strontium 90 it is necessary to take into account the amounts ingested from all sources. The average weight of food and water ingested per day per individual in the United States is 2.2 kilograms. If all food and water contained this concentration of 33 micromicrocuries per kilogram the daily intake of strontium 90 would be 73 micromicrocuries ( $2.2 \times 33$ ).

The following diet shows how the wheat data reported by the Atomic Energy Commission would be reflected in a typical adult diet of 2,200 grams per day. (A gram is  $\frac{1}{1,000}$  of a kilogram or  $\frac{1}{28.35}$  of an ounce.) This diet is adapted from one that was presented by the Public Health Service at hearings of the Joint Committee on Atomic Energy last year. An estimated average daily consumption of 1.8 grams of bran, as estimated by the U.S. Department of Agriculture, was added to this diet (rounded in the table to 2.0 grams). The strontium 90 values for bran and flour products in this diet are the average values of the Atomic

Energy Commission report. The strontium 90 values for other items of this diet are considered typical for a large metropolitan area.

Diet item	Strontium 90 content in micromicrocuries per gram	Food consumption in grams per day	Strontium 90 in micromicrocuries per day
Bran -----	0.231	2	0.4
Flour products-----	.012	227	2.7
Foods other than milk, water, and wheat products -----	.004	971	3.9
Milk and milk products -----	.010	410	4.1
Water and other non-milk fluids-----	.001	590	1.0
Total -----		2,200	12.1

The averages were used in the above table because the National Committee on Radiation Protection and the International Commission on Radiation Protection recommendations are for general population averages. It is, however, necessary to consider individual variations from the average involving the known deviations in concentrations of strontium 90 from the average and individual variations in dietary habits. In calculating the guidelines for specific averages, the National Committee on Radiation Protection and the International Commission on Radiation Protection recommendations allow departures as much as three times such averages. In a given case this could be equivalent to an individual lifetime average of 220 micromicrocuries of strontium 90 per day.

I have had my staff calculate the strontium 90 content of various probable diets under the varying concentrations of strontium 90 reported by the Atomic Energy Commission. The conclusion was that it would be highly improbable that any individual could attain an average of 73 micromicrocuries of strontium 90 per day for life, let alone the higher figure of 220 micromicrocuries.

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Available evidence indicates that in 1958 the major fraction of strontium 90 found in wheat was directly absorbed through the outer layer of the kernel, this coming from atmospheric deposition. Some is absorbed through other parts of the plant. The relative contribution of strontium 90 from various parts of the plant is dependent upon the existing conditions, such as atmospheric deposition, accumulation in the soil, and the weather. Studies reveal, however, that of the amount of strontium 90 absorbed by the leaves of the plant only very little is transported to other parts of the plant.

The strontium 90 in bran used for livestock feed is not posing a problem at this time. The total diet of livestock includes bonemeal and inorganic minerals as the principal sources of calcium. Research with the dairy animal has established the fact that milk contains about one-tenth of the amount of strontium 90 that is consumed in the feed. Since strontium 90 is deposited in the bones, it does not provide a problem in the meat of the beef animal.

Arthur P. Miller Retires

Arthur P. Miller, a sanitary engineer with the Public Health Service for nearly 40 years, retired on May 31.

During most of his career, Mr. Miller was stationed at headquarters in Washington, D.C., with responsibilities for water, vessel, and shellfish sanitation investigations, and surveys of sanitary engineering education.

Mr. Miller is author or co-author of about 100 publications in the engineering field. He is a member of the American Public Health Association and has served on its governing council and its editorial board. He has served as chairman of the publications committee of the Federation of Sewage Works Federations and as acting executive editor of *Public Health Reports*.

# Federal Publications

**First Things and Last.** The story of birth and death certificates. *PHS Publication No. 724; 1960; 24 pages; 15 cents.*

A pamphlet that tells what birth and death certificates are used for; who fills them out; and the route they travel from hospital, physician, and funeral director to the health department and permanent filing.

It is designed to inform persons who are involved in registration of birth and death certificates but who are not a direct part of the system.

**Cerebral Palsy.** Hope through research. *PHS Publication No. 713 (Health Information Series No. 95); 1960; leaflet; 5 cents, \$3 per 100.* Explains some known causes and discusses possible prevention of cerebral palsy. Describes main types and extent of condition, mentions common handicaps, and reviews helpful treatment. Gives sources of medical aid and stresses importance of research.

**Highlights of Progress in Research on Neurological and Sensory Disorders, 1959.** *PHS Publication No. 741; 1960; 60 pages; 25 cents.*

Items of interest on program developments and research studies conducted and supported during 1959 by the National Institute of Neurological Diseases and Blindness are presented. Subject areas include: nerve regeneration, the central nervous system, brain and cerebral cortex, infant abnormalities, neuromuscular disorders, parkinsonism, multiple sclerosis, amyotrophic lateral sclerosis, encephalitis, epilepsy, mental retardation, cerebral palsy, cerebrovascular diseases, and visual and hearing disorders.

Grants and training programs of several kinds are discussed as well as such collaborative projects as a 5-year study for early detection of glaucoma and the study on wastage in human pregnancy. In general, the institute's national and international attack on neurological and sensory disorders is outlined.

**National Institutes of Health.** *PHS Publication No. 81; revised 1960; 28 pages; 25 cents.*

This brochure is designed to give an overview of participation and support of the Nation's medical research program by the Federal Government through the National Institutes of Health, Public Health Service.

Pictures and text describe the organization and functions of the seven institutes and four divisions that make up the agency. Research studies are also discussed.

A brief history of NIH is included as well as a statement of present emphasis and philosophy.

**An Occupational Health Program for Hospital Employees.** *PHS Publication No. 725; 1959; 11 pages.*

Designed to help the hospital administrator resolve some practical problems relating to occupational health programs for hospital employees, this booklet attempts to answer questions concerning personnel, facilities and equipment, records, and costs.

Special sections are devoted to administrative relationships, services provided, and a list of references.

**Diabetes Program Guide.** *PHS Publication No. 596; revised 1960; 68 pages; 50 cents.*

Originally published in 1956, this guide has been used extensively by doctors, nurses, technicians, and administrators responsible for diabetes control in States and communities. It covers such topics as physiology of the disease; types of screening projects for diabetes detection; diagnostic standards, tests, and laboratory procedures; professional and community education; and other pertinent information.

Final results of the diabetes test validation studies replace preliminary data included in the first edition of the publication. Other text changes reflect newer thinking in diabetes management and detection.

**Immunization Information for International Travel.** *PHS Publication No. 384; revised 1960; 67 pages; 25 cents, \$18.75 per 100.*

Directed primarily to travelers going abroad, health departments, and physicians, this booklet gives current details on immunization requirements for persons entering the United States, including Americans returning from abroad, and lists requirements and recommendations for immunization in 200 other countries. A list of yellow fever vaccination centers and a special section on bringing pets into the United States is also included.

This edition supersedes the 1959 revision.

**Local Health Organization and Staffing Within Metropolitan Areas.** *PHS Publication No. 742; 1960; 184 pages; \$1.*

Data presented State by State show the organization and staffing of local health departments serving within the 189 standard metropolitan areas as defined September 1959 by the Bureau of the Budget.

In addition, the legal basis existing within each State under which jurisdictions may combine to provide local public health services is described. The data were compiled from reports made to the Public Health Service for specified periods in 1958 and fiscal year 1957.

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This section carries announcements of new publications prepared by the Public Health Service and of selected publications prepared with Federal support.

Unless otherwise indicated, publications for which prices are quoted are for sale by the Superintendent of Documents, U.S. Government Printing Office, Washington 25, D.C. Orders should be accompanied by cash, check, or money order and should fully identify the publication. Public Health Service publications which do not carry price quotations, as well as single sample copies of those for which prices are shown, can be obtained without charge from the Public Inquiries Branch, Office of Information, Public Health Service, Washington 25, D.C.

The Public Health Service does not supply publications other than its own.

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## U.S. Interest in World Nutrition

ARNOLD E. SCHAEFER, Ph.D., and FRANK B. BERRY, M.D.



The United States has a sincere interest in world nutrition. Food, nutrition, and health are basic needs of people everywhere, but hungry, underfed, malnourished populations can have little concern for anything but their need for food and well-being. They are subject to the ravages of disease, further diminishing their productive capacity. The result is a vicious revolving chain of physical, mental, and economic hardships.

To break this cycle there are those who advocate the "economic aspect" as the real and only solution to the world's problems. Health and well-being cannot be purchased, however, like a piece of machinery. Certainly the developing countries seek a vigorous economy. But economic vigor will come and be more lasting if it emanates from their own resources and productive capacity.

Education in the broad sense is fundamental to every stage of the search for technical, social, and economic development, which contributes to the improvement of life, liberty, and happiness for all people. Education by "seeing and doing," the so-called extension work or person-to-person approach, brings improvement and lasting benefits through its practical applica-

tion in agriculture, health, transportation, and industry. And development programs must be thought of in terms of decades, not years; not as temporary aid, but rather as long-term investments.

As we review the world's nutrition and health problems, it becomes clearly evident that the more fortunate countries must be willing to share their technical abilities to assist the less fortunate. It is most encouraging to note the wording of the 1958 amendment to the act authorizing U.S. participation in the World Health Organization, which states, "The Congress of the United States, recognizing that the diseases of mankind, because of their widespread prevalence, debilitating effects and heavy toll in human life, constitute a major deterrent to the efforts of many peoples to develop their economic resources and productive capacities and to improve their living conditions . . ." As the late Gen. George C. Marshall so aptly stated, the policy of the United States citizenry and Government is and must be directed against hunger, poverty, desperation, and chaos.

For more than a half century the United States has been engaged in combating world health problems, a notable example being the war against yellow fever by the Medical Corps of the Army. Since then there has been a tremendous expansion in research and aid in world health and nutrition by missionary groups, philanthropic organizations, and U.S. support of the United Nations agencies, Food and Agriculture Organization, World Health Organiza-

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*Dr. Schaefer is executive director of the Interdepartmental Committee on Nutrition for National Defense, National Institute of Arthritis and Metabolic Diseases, Public Health Service. Dr. Berry, chairman of the committee, is Assistant Secretary of Defense (Health and Medical), Department of Defense.*

## With the Help of Many

The degree of success achieved in demonstrating the interest of the United States in improved standards of nutrition throughout the world must be credited to the many individuals who arranged, assisted, and participated in the program of the Interdepartmental Committee on Nutrition for National Defense.

Special thanks are due Wilfred J. McNeil, former Assistant Secretary of Defense (Comptroller) and former Ambassador William C. Bullitt for their initial support.

The Office of International Security Affairs of the Department of Defense, by adding nutrition to the U.S. military assistance program and placing it in the perspective of a people-to-people approach, gave the words "for national defense" broader meaning—not only military defense of the host country but defense of its life, liberty, and well-being as well.

Nor would this program have been possible without the continuing support and cooperation of the National Institute of Arthritis and Metabolic Diseases, Public Health Service. The vision and plan-

ning of the late Dr. Harold R. Sandstead, first executive director of the committee, gave it direction.

The assistance of the Department of State and the sympathetic understanding of its late Secretary John Foster Dulles, the present Secretary Christian A. Herter, and Walter M. Rudolph, assistant science adviser and ICNND member, deserve a special acknowledgment. The staff of the International Cooperation Administration participated and aided in the initial survey programs and in followup work.

In each of the host countries, the staff of the U.S. Embassy has given noteworthy and continued assistance.

Finally, acknowledgment is made to the many United Nations agencies, such as the Food and Agriculture Organization, the World Health Organization, and the United Nations Children's Fund, for the assistance and guidance given by the staffs of international headquarters and the field missions.

The ICNND has granted permission for the publication of the papers on survey findings in this issue of *Public Health Reports*, marking the Fifth International Congress on Nutrition to be held in Washington, D.C., September 1-7, 1960.

tion, and United Nations Children's Fund. In addition, U.S. Government agencies, such as the Armed Forces, Public Health Service, and the International Cooperation Administration, assisted in great measure through our university and college staffs, have greatly expanded their activities in world health problems.

### Objectives

In early 1955, the Interdepartmental Committee on Nutrition for National Defense (ICNND) was established by a memorandum of agreement by the Departments of State, Defense, Agriculture, Health, Education, and Welfare, and the International Cooperation Administration. The committee was later joined by the Atomic Energy Commission.

The purpose of this committee, as set forth in the memorandum of agreement, is to supply assistance in nutrition problems of technical, military, and economic importance in foreign

countries. The committee is advised and guided by a group of consultants from colleges, universities, government, and private agencies, who are recognized throughout the world as specialists in nutrition, medicine, agriculture, food technology, and biochemistry.

To assist, one needs to know the problem. The lack of statistics on and definition of the major food and nutrition problems in the developing countries is strikingly evident from a mere glance at the reports and literature presently available. Thus the first step must be to resolve this lack. What are the problems? What preventive and corrective measures can be taken, based on the country's resources? Is immediate corrective assistance required?

In January 1956, official requests from the Governments of Turkey, Iran, and Pakistan to the U.S. Government for assistance led the committee to launch a medical nutrition appraisal program in these countries. From

the beginning, it was evident that, although most essential, the mere definition of major food and nutrition problems would be of little benefit to the country concerned or to its underfed and malnourished people. Therefore, the program was designed to assist countries in using their own resources to the best advantage. The need to bring these problems to the attention of the country's national governing bodies and to obtain support and necessary action was also recognized.

In general, a survey team is composed of the following specialists: physicians, biochemist (laboratory director), two or more laboratory assistants, food-service and nutrition specialists, dentists, food technologist, and agricultural economist. Personnel of the host country are given training by working side by side with U.S. team members on the nutrition survey in the areas of clinical, biochemical, and food and agricultural assessment. A unique opportunity is afforded to acquire new scientific knowledge essential to a better understanding and solution of nutrition deficiency diseases.

The armed forces of developing countries afforded many advantages of logistical ease when initiating a nutrition improvement program. These advantages were: (a) logistical ease in sampling and transportation, (b) ap-

praisal of young, physically active men, fresh from and soon to return to civilian life, (c) food supply, habits, customs, and the like which are usually identical with the local area in most countries, (d) ease of implementing and testing the program for improvement, (e) opportunity to initiate food standards and specifications (often nonexistent) on the largest organized group of consumers, and (f) carryover of benefits and improvements in nutrition into the civilian population. As shown in table 1, the more recent surveys have also included civilian populations.

Last, but perhaps most important, the committee in a followup phase makes consultant service available to assist further in specifically defined problem areas.

Many disciplines are essential in improving nutrition and health. It is vitally important to recognize, cooperate with, and assist the programs of the host governmental agencies responsible for health, agriculture, development, and education, and the participation of the U.S. missions and UN agencies having responsibilities in these areas as well.

By July 1, 1961, the committee's program will have been extended to 16 countries, including 5 in the Far East, 4 in the Near East, 4 in South America, 2 in Africa, and 1 in Europe, and also

Table 1. Countries cooperating in the ICNND nutrition program

Country	Date of survey	Number of other U.S. missions	Number of individuals examined	
			Total <sup>1</sup>	Civilian
Pakistan	January 1956	4	2, 019	
Iran	January 1956	4	1, 730	
Korea	June 1956	2	1, 514	
Philippines	February 1957	2	4, 234	
Turkey	April 1957	4	8, 519	
Libya	June 1957	3	3, 828	1, 629
Alaska <sup>2</sup>	February 1958	2	1, 518	805
Spain	April 1958	3	10, 727	
Ethiopia	September 1958	3	6, 400	6, 200
Peru	April 1959	2	8, 194	150
Ecuador	July 1959	2	7, 155	4, 816
Vietnam	October 1959	2	7, 428	4, 556
Chile	March 1960	2		
Colombia	May 1960	2		
Taiwan	September 1960	2		
Thailand	October 1960	2		
Lebanon	February 1961	3		

<sup>1</sup> Includes armed forces and civilians.

<sup>2</sup> Before becoming a State.



to our new State of Alaska (table 1). The procedures for conducting the surveys have been described in a number of publications (1-18).

In retrospect, it is most encouraging that the armed forces nutrition groups in Iran, Turkey, Pakistan, the Philippines, Korea, and Spain have extended their programs to bring assistance to the civilian population.

The success of these survey missions has been due in great part to the high caliber and dedicated spirit of the members of the nutrition teams, including the host country members. Host country team personnel have usually been supplied from not only the armed forces but from the Ministries of Health and Agriculture and from university staffs. The majority of the U.S. team personnel (numbering over 150) have been most generously supplied by 24 colleges and universities throughout the United States, 10 Government agencies, and more than 10 private or State agencies. The experiences of the team members have amply demonstrated that this is not a "one-way street." They have acquired new knowledge and brought back to their universities and laboratories new problems requiring further research. The surveys have engendered a mutual personal good will and understanding, and returning U.S. team members have joined the "double-duty corps," serving as *ex officio* ambassadors for the countries they visited. As Dr. James A. Shannon, director of the National Institutes of Health, summarized: "The surveys have stimulated and reawakened interest in clinical nutrition."

### Major Nutrition Problems

In many parts of the world, one may be misled at first sight by the good physiques of the people, but it is not unusual to find that life expectancy is short and mortality among children extremely high. The weak or malnourished are not seen walking down the roads and streets. Wherever malnutrition exists, it is always the children who suffer most.

In comparing the results in 14 countries recently surveyed by similar procedures (table 2), it becomes clear that although there are many similarities in nutrition problems, each country, and more often areas within the country, must be considered separately and prac-

tical recommendations advanced for the specific area. In comparing the generalizations given in table 2, one must keep in mind that some of the surveys involved only military populations. As would be expected, the greater number of nutrition problems existed in the vulnerable civilian population, particularly among children and pregnant or lactating women.

Inadequate riboflavin nutriture was the most prevalent general finding in seven countries and a special area or group problem in four. Next in frequency of indicator lesions suggestive of suboptimal nutrition was lack of vitamin A (general in three countries, in special areas of seven); vitamin C (general in one, in special areas of nine); and thiamine (general in three, in special areas of six). Endemic goiter was found in eight of the countries; however, it was usually confined to specific areas. Protein malnutrition and caloric deficit, although a serious problem in the Korean military in 1953, has been alleviated. A survey in Haiti (19), conducted under the auspices of the Williams-Waterman Fund, revealed protein malnutrition to be one of the major problems. As usual, the groups most seriously afflicted were infants, children, and pregnant and lactating women. Anemia of unspecified origin was noted in special groups in seven countries, also, particularly prevalent in mothers and young children and often associated with parasitic infestation. At the time of the Ethiopian, Libyan, and Haitian surveys, the general caloric intake was appraised as suboptimal.

Although we have discussed malnutrition in only a general way, the seriousness of acute nutritional disease has been brought vividly to the attention of the medical profession. As an example, Dr. Oomen (20) has stated, "Xerophthalmia has been the most bitter pill for me to swallow during 18 years of doctor's work in Indonesia. The repeated experience of discovering a child recently blinded in the arms of the mother, having to tell her that I now could do nothing more to save the eyesight, remembering that I could have done so with a few spoonfuls of cod liver oil some days ago, these things still enter my nightmares. . . . More printing space nowadays is devoted to a few cases of hypervitaminosis A, induced by an irresponsible vitamin racket, than to the thousands of small

children who die or go blind every year due to the lack of a handful of vitamin A units. What on earth is nutritional science good for, even in the atomic age, if it is not capable of counter-acting one of the foulest consequences of bad nutrition?"

Another personal experience was reported to the authors by former Ambassador William C. Bullitt. A young Chinese boy in Taiwan was suffering from night blindness and early stages of xerophthalmia. His doctor informed him that the disease was so far advanced that blindness was inevitable. This young man was befriended by Ambassador Bullitt, employed in his household, and given vitamin A therapy. He recovered his eyesight, is now a sergeant in the Marines, and qualified recently in rifle marksmanship.

### Accomplishments

#### *Iran*

An Armed Forces Nutrition Committee and Institute was formally established in Iran following the medical nutrition survey in early 1956. Research is in progress on the stability

of vitamins and the nutritional evaluation of local foods before and after processing. A modern food and nutrition laboratory was completed in late 1959. The nutrition team of the Iranian Armed Forces has conducted surveys in numerous areas of the country and at various seasons of the year. These surveys revealed evidence of the vast improvement in nutrition and health which followed implementation of the recommendations of the 1956 appraisal. A significant contribution was the modernization and reopening in the fall of 1956 of the Shahi food canning plant, which now supplies canned meat, fruit, and vegetables to the armed forces and civilians. The first Iranian Armed Forces "field-type" ration has been developed using these products. Technical assistance was given by the U.S. International Cooperation Administration's Operations Mission. In the first year of operation, local farmers received an added cash farm income of more than \$250,000. A second food cannery is under construction.

The rations for the armed forces now include fish and an increased variety of local vegetables

**Table 2. Prevalence of nutrition problems in 13 countries and Alaska, as revealed by ICNND surveys**

Country	Ribo- flavin	Vitamin A	Vitamin C	Thiamine	Goiter	Anemia	Protein	Caloric deficit
<i>Military</i>								
Pakistan (5) -----			C		B			
Iran (6) -----	A	B	B					
Turkey (7) -----	A	A	B		B			
Korea (10):								
1953 -----	A	A	A	B		B	A	A
1956 -----	A	B				B		
Philippines (11) -----	A			A				
Peru (15) -----			B	C		B		
Spain (17) -----	B	B	B	B	B			
<i>Civilian</i>								
Ethiopia (8) -----	C	A	B	B	B		B	A
Haiti (19) -----	A	B			B	B	A	A
<i>Civilian and military</i>								
Libya (9) -----	B	B	A	A	B	B	B	A
Taiwan (12, 13) -----	A	A	B	C		B		
Vietnam (14) -----	A	C		A	B	B		
Ecuador (16) -----	B	C		B	B	B	B	
Alaska (18) -----		C	C	C				

NOTE: Numbers in parentheses are references.

LEGEND: A, general nutrition problem; B, problem in specific areas of the country or in special groups; C, evidence manifested by clinical or biochemical or dietary evidence in special areas or groups.

and fruits. Vegetable oils are being fortified with vitamin A. The director of the nutrition laboratory established a poultry (broiler) raising industry which proved successful and served to stimulate private enterprise. Poultry raised by the armed forces is issued as a special supplement for hospital diets.

Specifications and quality control for purchasing and processing foods have been and are being developed. At the Shahi cannery, veterinary officers of the Imperial Iranian Armed Forces serve as food inspectors regardless of whether the consumers are the armed forces or civilians. At the Seventh Iranian Medical Congress in 1959, devoted to nutrition, the Armed Forces Nutrition Committee presented their research findings and a practical program for nutrition improvement. The committee also endorsed the need for a nutritional appraisal of the civilian population. Arrangements have been completed by the committee to have a clinician and a biochemist receive advanced training in nutrition in the United States.

Iran organized the First Armed Forces Inter-Nation Nutrition Conference, held in Teheran, November 1956, and attended by delegates from Pakistan, Turkey, Iraq, the United Kingdom, and the United States.

### *Pakistan*

An Armed Forces Nutrition Service advisory group of consultants and specialists was established in Pakistan as recommended after the nutrition survey of 1956. Laboratory equipment and supplies were transferred by ICNND and used to equip a newly formed Armed Forces Institute of Nutrition. The advisory group, through the institute, initiates, directs, and advises on nutritional research problems affecting the armed forces and their families.

Local foods have been analyzed, especially for riboflavin and vitamin C, to determine their value in supplementing the diet. Study is underway to develop a guava powder as a possibly excellent and cheap source of vitamin C. Studies of vitamin C cooking losses, and methods of minimizing them, have been carried out. New areas and groups, including two civilian schools, have been surveyed. A special study on the prevalence of iron deficiency in

recruits, soldiers, and their families was completed and recommendations made for treatment of the anemia; further investigations on ascorbic acid deficiency were made, and study of the goiter problem in the Muzaffarabad area is underway.

Food processing has expanded rapidly in Pakistan and excellent progress has been made, in cooperation with the Armed Forces Nutrition Institute, in developing a cracker-type field ration.

Pakistan sponsored the Third Armed Forces Inter-Nation Nutrition Conference in October 1959, attended by delegates from Iran, Turkey, Libya, Great Britain, FAO, and the United States.

The Pakistan Armed Forces have established liaison with civilian agencies, and a member of the Armed Forces Council on Medical Research serves with the governing body of the Pakistan Medical Research Council.

Lt. General W. A. Burki, who was Surgeon General of the Armed Forces at the time of the 1956 survey, is now Minister of Health and Labor. He has indicated a desire to extend the nutrition program to the civilian population.

### *Turkey*

The Turkish Armed Forces Nutrition Institute (TANI) was officially established. A new ration law, enacted by the Government of Turkey, was followed by menu and ration issue changes which resulted in a nutritionally improved diet. Numerous nutrition surveys have been carried out in different areas and at various seasons since the initial survey in 1956. A progressive nutrition research and development program is underway, which includes food analysis, food technology, biochemistry, and medicine. Schools for training cooks, bakers, and mess officers have been established. Co-operative studies with the staffs of the universities, FAO, and the U.S. Operations Mission are being conducted in numerous civilian schools and institutions.

A field trial to evaluate the practicability and effectiveness of enriching bread with riboflavin for both civilian and military personnel is in progress. Two members of the TANI staff have received additional training in the United

States, one in nutrition and biochemistry, and the other in quartermaster subsistence techniques.

Turkey, with technical assistance from ICA, established a modern meatpacking plant, the supervisors and technicians receiving their training in the United States.

Turkey was host to the Second Armed Forces Inter-Nation Nutrition Conference in Ankara, April 1958, attended by delegates from Iran, Pakistan, Iraq, the United Kingdom, and the United States. The proceedings were published in both Turkish and English (21).

### *Korea*

The first opportunity to evaluate the benefits resulting from a nutrition survey came in 1956 when a resurvey was made of the Korean Armed Forces after an initial survey in 1953 conducted by the office of the Surgeon General of the U.S. Army. This resurvey revealed that there was indeed a measurable improvement in the nutritional status of the troops. Following this finding, a central food service committee was established.

There has been continued improvement in the ration planning and issue system. A list of food substitutes to be used as a guide for ration purchase and distribution has been developed. A food laboratory is actively engaged in the development of emergency field-type rations based on indigenous foods. A local gardening and agricultural program has been instituted, one of the most successful examples in the world of agricultural extension work through the armed forces. The improvement in the ration planning and distribution system has consistently reduced overall costs and at the same time enabled the issue of a better balanced ration. A school for training mess officers and cooks has been added to the regular quartermaster training courses.

The improvements in nutrition and health in Korea have been outstanding, combining the various disciplines of education, agriculture, transportation, economics, sanitation, and health.

### *Taiwan (the Republic of China)*

The initial nutrition survey of the Republic of China, Taiwan, was conducted in the fall of

1954 under the auspices of the Surgeon General of the U.S. Army. The ICNND has been requested by the Government of China to reappraise the nutritional status of the armed forces in Taiwan in order to evaluate the effectiveness of the program they have instituted. This survey is planned for September 1960.

The committee assisted in followup work after the 1954 survey by preparing a report on the need for rice enrichment. Two rice enrichment plants, supplied under the Military Assistance Program, have now been in operation for over 2 years. This program, as assessed by the Chinese, is indeed a successful one. It is envisioned that this will be extended to the civilian population. Dr. John B. Youmans, member of the ICNND, made a trip to Taiwan recently and reported: "The Chinese National Armed Forces have an active nutrition program well underway. It appears to be of good quality and indeed effective."

The armed forces, through their excellent vegetable gardening, have made a remarkable contribution to the overall food production of Taiwan. This program not only assists in supplementing the ration with a variety of vegetables and other foods, but also serves as an agricultural training ground for soldiers who will be returning to civilian life.

### *The Philippines*

A nutrition survey was conducted in the Philippines in 1957. In 1959, the ICNND was requested by the Philippine Government and the U.S. Operations Mission to supply a nutritionist and a food technologist to give further assistance in improving nutrition.

The former Philippines Institute of Nutrition has been reorganized so that it is now the Food and Nutrition Research Center of the National Science Development Board. The director of the Food and Nutrition Research Center is a member of the newly organized Armed Forces Central Food and Nutrition Board. Through this board and in cooperation with the nutrition laboratory, an active program has been organized to implement the recommendations of the 1957 survey report. A training course for officers in food service has been prepared and will be ready for operation by July 1, 1960, with an instructional staff drawn primarily from the

Food and Nutrition Research Center. Improvements are being made in ration planning and food distribution. The board has recommended that the use of enriched rice in the armed forces be mandatory. This procedure itself may contribute greatly to the eventual use of enriched rice by the civilian population of the Philippines.

### *Spain*

A nutrition laboratory for the armed forces has been established in Spain's University of Madrid School of Medicine. The ICNND Manual for Nutrition Surveys was translated into Spanish, increasing its usefulness in Spanish-speaking countries. Nutrition survey techniques and programs have been extended to the civilian population by the armed forces and the Ministry of Health. Recommended changes in the ration distribution system have been made and an active program of education has been established for personnel involved in food and nutrition.

### *Libya*

The U.S. Operations Mission in Libya was hopeful of establishing a nutrition group to work initially in the child and maternal health clinics following the ICNND survey in 1957. This has not yet materialized, and a laboratory established at the time of the survey is currently on a standby basis.

However, progress has been made through the followup program of FAO in improving the feeding of school children. During the past year Dr. M. R. Barakat, FAO nutrition education specialist, established two nutrition education centers for headmasters and school teachers. The courses lasting approximately 1 month, were attended by a total of 62 Libyan teachers. A book on nutrition for Libyan primary school teachers was written and translated into Arabic. FAO is greatly encouraged by the progress made in nutrition education and the improved diet of school children.

### *Ethiopia*

Immediately following the initial nutrition survey in Ethiopia in the fall of 1958, another survey of 6,000 school children was conducted by the counterpart members of the original

team. A therapeutic test is still in progress to determine whether the observed eye lesions (Bitot's spots), with vitamin A deficiency the suspected cause, will respond to vitamin A therapy (22), and also to determine the effectiveness of vitamin C in counteracting the high incidence of gingival lesions noted in the school children.

The Medical Advisory Council and the Minister of Health approved and established recently a nutrition council composed of technical and administrative personnel of the Government agencies responsible for health, agriculture, and education. A nutrition consultant, acting as secretary to the Nutrition Council, is to be assigned for the purpose of integrating nutrition into the programs of the Public Health School at Gondar, the Agriculture Schools at Jimma and Alemaya, the School of Nursing in Asmara, and the University of Addis Ababa. A nutrition laboratory, equipped by the ICNND, has been established at the Pasteur Institute. Personnel have been assigned and a program outlined to enable appraisal by a small epidemiological team of specific nutrition problems as they occur throughout the country.

One of the U.S. team members, Dr. Lester J. Teply, organized a group of Ethiopian students at the University of Wisconsin to discuss individual student problems and to give thought to ways and means by which students, after being trained in other countries, could return to Ethiopia and contribute to the overall improvement, well-being, and health of their people. This idea was expanded by the students themselves and has culminated in the formation of an Ethiopian Student Association, which includes nearly 50 students attending colleges and universities in the United States and Canada.

### *Peru*

An Armed Forces Institute of Nutrition was promptly established in Peru. The counterpart team members have extended the appraisal of the nutritional status of their armed forces by conducting an excellent survey of over 1,600 troops in Peru. Their nutrition and food control laboratories have been combined by the armed forces in order to pursue an active, encompassing nutrition program.

## *Ecuador*

Although the nutrition survey has been completed only recently in Ecuador, sincere interest has been expressed by Government officials, including the Ministries of Defense, Health, and Agriculture, the U.S. Operations Mission, and the U.S. Military Assistance Group, in joining forces to improve nutrition in the entire population of Ecuador. Laboratory equipment and supplies were transferred by the ICNND to the National Institute of Nutrition of Ecuador. The present World Health Organization/Pan American Sanitary Bureau nutrition adviser to Ecuador was a team member of the ICNND survey.

## *Vietnam*

The Vietnam survey having just been completed, it is too early to evaluate accomplishments. However, the key people who served as counterpart personnel on the nutrition survey have been retained in the newly established nutrition laboratory and are actively engaged in assisting local hospitals in diagnosing malnutrition. The excellent cooperation received from the President of Vietnam, the Minister of Health, the Minister of Defense, and the U.S. Mission team leaves little doubt that nutrition will be improved in Vietnam.

## **Summary**

The Interdepartmental Committee on Nutrition for National Defense (ICNND), established in 1955, is an expression of the interest of the United States in world nutrition. Representatives of the Departments of State, Defense, Agriculture, and Health, Education, and Welfare, the International Cooperation Administration, and the Atomic Energy Commission are members of the committee and participate in its work.

The committee supplies, on request, technical assistance to foreign countries in assessing and improving nutritional health. Consultants from colleges, universities, Government, and private agencies give advice and guidance to the committee in nutrition, medicine, agriculture, food technology, and biochemistry. U.S. nutrition teams composed of specialists in these disciplines work side by side with a counterpart team of specialists from the country surveyed.

and suggest methods which will effect improvement using available resources.

The nutrition studies sponsored by the committee are a cooperative, scientific, training, and people-to-people program.

Progressive action has been taken to improve the nutrition of the armed forces and the civilian population in 12 countries following ICNND surveys. By July 1, 1961, the committee's operations will have been extended to 16 countries, including 5 in the Far East, 4 in the Near East, 4 in South America, 2 in Africa, and 1 in Europe, and to Alaska, the 49th State.

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## Latest Nutrition Surveys

Teams of specialists completed the 13th ICNND survey in Chile in June and the 14th in Colombia in August 1960. Future surveys are scheduled to begin in Taiwan in September 1960, in Thailand in October 1960, and in Lebanon in February 1961.

The surveys, which lasted for approximately 70 days in the two Latin American nations, were requested by the respective governments to assess the nutritional status of large sections of the civilian and military populations. The teams of clinicians, biochemists, nutritionists, dentists, food technologists, and others from various institutions in the United States worked with counterpart Chilean or Colombian personnel in conducting physical examinations, biochemical studies, and dietary surveys. The purpose of the work was to formulate practical recommendations for improvement of nutrition consistent with the resources of the countries and to assist in developing standard ration requirements and local nutrition services.

After the surveys, laboratory equipment and supplies sent to the countries were turned over to the Governments of Chile and Colombia to be used in operating permanent nutrition services.

# Suggested Guide for Interpreting Dietary and Biochemical Data

INTERDEPARTMENTAL COMMITTEE on NUTRITION for NATIONAL DEFENSE

*These provisional standards were submitted by the Committee of Consultants to the Interdepartmental Committee on Nutrition for National Defense and were accepted by the committee. The standards were arrived at after long consideration and a pooling of the experience and knowledge of the consultants. This guide merely indicates the extensive evidence upon which the standards are based.*

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Three procedures of value in surveys to assess the nutritional status of a population are clinical assessment, biochemical studies of blood and urine, and collection of dietary information. The conduct of surveys presupposes the availability of some standards of reference for interpreting the results obtained. With the initiation by the Interdepartmental

Committee on Nutrition for National Defense (ICNND) of a program of nutrition surveys it was essential to define some tentative standards for use in assessing the data in terms indicative of the practical significance of the observations. Although evaluation of the dietary and biochemical data only is considered in this paper, it is evident that all three methods are necessary for a logical overall evaluation of a particular situation. Major disagreements among the three approaches, if consistently found in population groups (as opposed to individuals) and if not explained by recent changes in dietary intakes, must be regarded as a strong indication of error in the assessment.

The Recommended Dietary Allowances of the National Research Council Food and Nutrition Board (1) or the somewhat similar standards proposed by other official bodies, such as the Canadian Council on Nutrition (2) and the British Medical Association (3), often have been employed in the evaluation of dietary surveys in this country as well as in other parts of the world. As indicated by the statement of the Food and Nutrition Board, "The allowances are designed to maintain good nutrition in healthy persons in the United States." They were not designed as standards for assessing survey results. They are not necessarily applicable to situations of stringency or limited food supply. Since the latter conditions are likely to exist in many situations, it is evident



that use of the NRC allowances in assessing nutritional adequacy is unrealistic and impracticable. It is the aim of this paper to present provisional standards for use in interpreting nutrition surveys made by the methods detailed by the ICNND in its Manual for Nutrition Surveys. This purpose is quite different from that of the standards referred to previously.

A major difficulty in attempts to utilize the NRC recommended allowances in the assessment of dietary information is that they are not uniformly related to minimal needs. For example, it would probably be generally agreed that intakes of only 50 percent of the allowances for ascorbic acid, iron, and calcium in adult men have entirely different implications than do similarly low intakes of thiamine, riboflavin, protein, or calories. Thus the commonly used method of reporting the proportion of the population consuming 50, 75, and 100 percent or some other arbitrary division of the allowances does not determine the relative severity of the inadequacies in the diet.

In many situations where resources are limited the most useful service a nutrition survey can make is to point to the critical nutritional areas in which large gains in health and efficiency can be obtained. It is obvious that correction of problems in these areas should be attacked before efforts are made to provide the less urgent benefits which might be obtained from other dietary changes. A cogent example would be the consistent finding in practically any area of the world, including the United States, that, relative to the NRC recommended allowances, calcium is a "principal deficiency." Since this so-called "deficiency" is not demonstrable in measurable terms of health, and no benefit to man of an increased calcium intake has as yet been conclusively demonstrated, it is doubtful whether specific efforts are justified in most regions to meet the supposed deficit. Rather, efforts and expenditures should be directed to more tangible problems.

Undoubtedly many individuals will consider the proposal that intakes which are much below the NRC recommended allowances are "acceptable" as a weakening of the nutritional baseline. We do not believe this to be true. Nutritional research has increasingly emphasized the im-

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## Goldberger Award to Vilter

The 1960 Joseph Goldberger Award for outstanding work in nutrition was awarded to Dr. Richard W. Vilter, professor of medicine, Cincinnati College of Medicine. Dr. Vilter led a World Health Organization survey of the causes of anemia and nutritional deficiency diseases in Egypt in 1954, and made a similar study in Guatemala and Panama in 1955 at the request of the Pan American Sanitary Bureau.

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portance of obesity, atherosclerosis, and other degenerative diseases, and is placing suspicion upon overnutrition of various kinds. It may be noted that many of the less abundantly fed populations are relatively free of those diseases which are a major cause of death in the United States. Optimum nutrition is undoubtedly obtained by an intake of neither too little nor too much of each specific nutrient. Although no attempt has been made in this report to set the upper limits on desirable intakes, this consideration should receive increasing emphasis in the future. The present standards have regarded "adequacy" as above the level at which objective evidence of health improvement does not occur. The standards in this guide are an attempt at an objective evaluation of the data currently available as derived from clinical, experimental, and epidemiological evidence.

The term "high" is used in these standards in the sense of high for the prevention of recognizable clinical deficiencies or definite biochemical evidence of deficiency. Good or satisfactory would be advocated by many to replace this term. Nutrient consumption and biochemical values in the high range will be found in many countries which enjoy a high level of health and productivity. However, the precise health advantages which attend these high levels are the subject of much difference of opinion and little conclusive evidence. There is no implication that intakes in this range are sufficiently high to be detrimental.

The dietary intakes, blood content, or urinary excretion levels designated as "deficient" are those which may be expected to be associated

with definite, although not necessarily severe, physical impairment due to insufficiency of a nutrient in a measurable proportion of individuals. It is recognized that there are probably substantial quantitative differences in the nutritional requirements of individuals. These differences, combined with the errors of sampling and of laboratory determination and the substantial differences among physicians in the appraisal of various physical abnormalities, may be expected to prevent a high correlation between the dietary, biochemical, and clinical evaluation of individuals. Repeated study by all three methods should tend to eliminate such discrepancies. If the various standards proposed are realistic, there should be a measure of agreement of the three methods when applied to population groups over reasonable periods of time.

It should be emphasized that these guidelines are proposed for the express purpose of evaluating and interpreting dietaries in relation to nutritive state. Therefore, the purpose is quite different from that of the NRC recommended allowances in some instances.

### Dietary Standards

Since the primary interest of the Interdepartmental Committee on Nutrition for National Defense was directed toward the nutritional status of the armed forces in various countries, the dietary standards for the interpretation of nutrient intake data were designed to apply to adult males, physically active, with an average height of 67 inches (170 cm.) and weight of 143 pounds (65 kg.) living in a

**Table 1. Average percentage of nutrients lost during cooking**

Food items	Thiamine	Riboflavin	Niacin	Ascorbic acid
Meats	35	20	25	-----
Meats plus drippings	25	5	10	-----
Eggs	25	10	0	-----
Cereals	10	0	10	-----
Legumes	20	0	0	-----
Vegetables—leafy green and yellow	40	25	25	60
Tomatoes	5	5	5	15
Vegetables, other	25	15	25	60
Potatoes	40	25	25	60

temperate climate and consuming a varied diet. Wherever evidence is available to justify and allow modification because of age, body size, activity, climate, type of food, and other factors, such modifications should be made.

Calculations of dietary information collected should make appropriate allowance for nutrient losses during food preparation and storage. Despite recognition that such losses vary depending upon differing preparation and cooking methods in use in different cultures, and that local values should be used whenever they are available and reliable, the values in table 1 were regarded as reasonable approximations in the absence of more specific data. These values have been taken directly from the Army Technical Manual, TM 8-501 (4), and represent losses with good cooking practice with U.S. Army ration components.

From the good agreement between calculated values for the raw food and analytic values for the cooked food samples from the army messes in most countries surveyed by ICNND, it would appear that cooking losses are not so great as those indicated in table 1. The calculations in the survey reports assume valid values for the composition of the local foods. However, knowledge of nutrient composition is often fragmentary. Additional studies on the composition of raw and cooked foods would usefully extend knowledge basic to evaluation by dietary studies.

Table 2 presents the suggested standards for the evaluation of nutrient intake. Although within the space allotted it is not possible to document fully the reasons for these suggested values, the basic facts are presented for each nutrient.

*Thiamine.* The minimum need of thiamine may be considered as reasonably well established since studies on animals and man are in essential agreement. Clear-cut evidence of thiamine deficiency has been obtained at levels below 0.2 mg. per 1,000 calories (5-7). Epidemiological evidence suggests a similar figure (8). Evidence of unsaturation is available at intakes of about 0.3 mg. per 1,000 calories (9). Although there is good evidence of a relationship between thiamine need and caloric expenditure, it is not entirely clear that this is uniform at all levels of caloric intake. It is accepted that

**Table 2. Suggested guide to interpretation of nutrient intake data for physically active young adult males**

Nutrient	Deficient	Low	Acceptable	High
Niacin (mg./day).....	<5	5-9	10-14	≥15
Riboflavin (mg./day).....	<.7	0.7-1.1	1.2-1.4	≥1.5
Thiamine (mg./1,000 calories).....	<.2	0.2-0.29	0.3-0.4	≥.5
Ascorbic acid (mg./day).....	<10	10-29	30-49	≥50
Vitamin A (I.U./day).....	<2,000	2,000-3,499	3,500-4,999	≥5,000
Calcium (gm./day).....	<.3	0.30-0.39	0.4-0.7	≥.8
Iron (mg./day).....	<6.0	6-8	9-11	≥12
Protein (gm./kg. body weight).....	<.5	0.5-0.9	1.0-1.4	≥1.5

fat in the diet spares thiamine, although the data on man do not permit quantitation of the effect. Refinement of the estimate to allow for the thiamine-sparing effect of fat has not been attempted, but its possible importance should not be ignored in the interpretation of data.

*Niacin.* The requirement for niacin for animals and man is approximately 10 times the thiamine requirement. From the composition of pellagragenic diets Frazier and Friedemann (10) estimated 7.5 mg. of niacin per day as a minimum requirement. Pellagra has been produced experimentally on diets very low in tryptophan (200 mg.) which contained about 5 mg. of niacin (11). On the other hand, pellagra was not observed with diets supplying similar amounts of niacin when relatively good sources of tryptophan were present (12) or in a North Carolina population consuming an average of 5 mg. daily (13). Evidence of tissue unsaturation has been found with diets low in tryptophan and containing 8 to 10 mg. of niacin. The kind and amount of dietary protein is thus of importance. Approximately 60 mg. of tryptophan may be considered roughly equivalent to 1 mg. of niacin. The availability of niacin in various foods may also vary (14, 15), and contribute to the well-known epidemiological relationship between corn diets and pellagra.

*Riboflavin.* Evident signs of riboflavin deficiency have been produced at levels of intake below 0.6 mg. per day, and progressive tissue unsaturation, as measured by urinary excretion, may be noted at levels below 1.1 to 1.3 mg. per day (16, 17). Although on the basis of the known functions of riboflavin one might expect the requirement to be related to caloric expenditure, the evidence is not so convincing as it is with thiamine, and there is some evidence to the

contrary. The minimum level of 0.7 mg., listed as "deficient," is somewhat at variance with the data from Formosa (18), where there was clinical evidence of deficiency with intakes approximating 0.9 mg. per day and also from some of the data from the ICNND nutrition surveys.

Since there is experimental evidence that the composition of the diet influences the riboflavin requirement in animals and man (19, 20), additional studies under varying environmental conditions are needed. Possibly such factors as exposure to sunlight, availability of riboflavin in foods, and intestinal synthesis may be of importance. It may also be noted that in growing animals the riboflavin requirement appears to be about one and one-half times the thiamine need, a relatively higher level than that indicated here.

Despite these presently recognized uncertainties, it is held that the level adopted is a useful approximation for the interpretation of the practical significance of survey findings.

*Ascorbic acid.* An intake of 30 mg. per day of ascorbic acid is considered adequate to prevent all evidence of deficiency (21, 22). Whether higher levels are beneficial is controversial (23). In view of the lability of ascorbic acid to cooking and storage losses, a somewhat larger allowance above the minimum need than that provided for other nutrients can be justified.

An intake of 10 mg. of ascorbic acid per day will prevent frank scurvy in most adults. The data from six of the first ICNND surveys (24) indicate that serum ascorbic acid levels were definitely reduced when the daily dietary intake was in the range of 15 to 23 mg., and they were apparently associated with an increase in gingival pathology.

*Vitamin A.* A minimum need of 20 International Units of preformed vitamin A or 40 I.U. (24 micrograms) of beta-carotene (one I.U. equals 0.6 micrograms of beta-carotene) per kilogram of body weight per day is indicated. These values yield figures of approximately 1,300 I.U. of vitamin A, or 2,600 I.U. of beta-carotene per man per day. From their studies Hume and Krebs (25) estimated that 1,300 I.U. is the approximate requirement of preformed vitamin A in man and that 2,500 I.U. provides a reasonable margin of safety.

Hume and Krebs concluded that 3,000 I.U. is the minimum dose of beta-carotene to meet the vitamin A requirement but considered 7,500 I.U. as a desirable intake because of variability of carotene absorption. It should be noted that, in general, studies on requirements indicate a ratio of activity of vitamin A to carotene of 1 to 4, whereas by usual definition the ratio is 1 to 2. The absorption and utilization of carotene probably falls as its intake is increased. Furthermore, carotene absorption varies from food to food with methods of preparation and is influenced by fat and antioxidant content of the diet and probably other factors. Thus it may be impossible to specify accurately a single value for vitamin A requirements in terms of carotene under various conditions.

The present recommended allowances (1) for vitamin A are based on an assumption that the diet will supply approximately one-third of the activity as preformed vitamin A and the remainder as carotene. This is a condition which is not often fulfilled, especially when one is concerned with wide varieties of national and local patterns of diet. Whether further refinements will be useful or can be formulated remains to be seen. We believe that a fairly wide margin between minimal and acceptable levels is justified since, if good sources are available, a high intake is rather easily achieved.

Dietary sources of vitamin A are often seasonal. In view of body storage of this vitamin and the long time required for depletion, an intermittent intake is not necessarily bad, unless intervals of real depletion occur. Intermittent or seasonal intakes may be the most economic method of meeting the needs. On the other hand, this pattern results in a more precarious situation than that of a continuous supply, and,

in areas where such seasonal variations exist, definitive studies of vitamin A status are indicated.

*Calcium.* All data upon which previous calcium allowances are based came from balance studies. It now appears that these are not a reflection of calcium need (26-28). In people accustomed to low calcium diets, balance is achieved at levels of intake of 0.3 gm. per day or lower. Since no biochemical test is available to estimate calcium status and the clinical syndrome of calcium deficiency has not been produced experimentally in man, there is no satisfactory means of estimating the minimum need. Epidemiological evidence indicates that people remain in good health and do not demonstrate, insofar as is known, calcium deficiency upon diets containing about 0.3 gm. of calcium per day. No valid means are available for the translation of data from studies upon experimental animals into quantitative human needs. The values for calcium are, therefore, the most tentative of all which have been presented.

*Iron.* In normal men, the daily iron loss approximates 1 mg. An absorption of approximately 10 percent is ordinarily found, leading to an apparent requirement of 9 to 12 mg. per day (29). It should be apparent that such figures may simply be a reflection of the necessary mechanics required to maintain balance in a person consuming about 10 mg. per day. There is evidence that iron is conserved by both decreased excretion and increased absorption as body stores fall. Thus, there appear to be efficient mechanisms for protection against iron deficiency in the normal male, and maintenance of hemoglobin and protection against iron deficiency is found at intakes much below 9 to 12 mg. per day. Due to growth, pregnancy, or periodic iron loss through menstrual bleeding, the situation in children and women may be quite different. There is abundant evidence that iron requirements are increased by infestation with parasites which lead to blood loss. These factors may be important in a military force. Clearly, in male populations evidence of malnutrition due to iron deficiency must come primarily from evidence other than the dietary intake, that is, hematological or biochemical data.

*Protein.* In normal adults nitrogen balance

is readily achieved with high quality protein at approximately 0.3 gm. per kilogram of body weight per day and with many vegetable diets at 0.5 gm. per kilogram of body weight per day (30). It should be noted that, contrary to the situation with calcium, balance figures are more meaningful because of the rapid adjustment which the body makes to changes in the protein intake. Nevertheless, the difficulties of interpreting balance studies in terms of health and need are widely recognized. It is also impressive that syndromes typical of protein deficiency are rare in adults even in areas where protein intakes are low by U.S. standards. This is consistent with the fact that a daily intake of 3,000 calories from a cereal source signifies an intake of some 60 gm. or more of protein. Such an intake approaching 1 gm. per kilogram of body weight per day is rather easily achieved provided the caloric intake is sufficiently high.

*Calories.* The standards for the evaluation of caloric intakes are the same as those of the Food and Nutrition Board of the National Research Council (1), which were adapted from the report of the Food and Agriculture Organization Committee (31). They have been thoroughly discussed in those publications. Physical activity and needs for temperature maintenance are major factors determining energy needs but are difficult to evaluate. There is evidence that the standards may overestimate the needs of certain groups. The data of Konishi and co-workers (32) indicate that in military troops the change in caloric intake was not proportional to the body weight in kilograms raised to the 0.73 power ( $wt.^{0.73}$ ), the base used for estimating need. It is difficult to assess whether the populations upon which standard data have been based are of ideal weight. Furthermore, it is known that there is an adaptation to restricted caloric intake (33) both by lowered metabolism and by decreased ability and desire to work. Adjustments are made for age and environmental temperature. The effect of climate depends not only upon the temperature, but also on the amount of exposure, the clothing worn, housing, and other factors.

Because of the grossness of the estimates of these several factors in determining dietary needs, attempts to evaluate the adequacy of caloric intake in a nutrition survey should rest

largely upon physical appearance and physical measurements, rather than on the intake data. Military personnel with restricted feeding habits and relatively standardized workloads and environments offer opportunities for extension of studies of these factors.

### Biochemical Standards

*Urinary excretion.* The collection of urine samples over a 24-hour period is virtually impossible in most field studies, and shorter periods of collection are essential if urinary samples are to be obtained. There are three possible baselines for the evaluation of the data: a timed sample, urinary volume, or urinary creatinine. Although the relation of these three parameters to the excretion of vitamins or their metabolites deserves more complete investigation, in one study (34) in which they were compared as baselines for riboflavin excretion, urine volume was found to be the least desirable. Timed collections and creatinine excretion were consistent with each other and essentially of equal value. As would be expected, the percentage variability between samples decreased as the volume of the sample increased.

Thus, the most desirable sample should be one collected over the longest period of time. On the other hand, the accuracy of the estimate was not greatly increased by an 8- or 12-hour collection as compared with a 6-hour collection. There is reason to believe that thiamine and N'-methylnicotinamide excretion also follow this general pattern. Under the practical conditions of the field it is often impossible to obtain accurately timed specimens; hence the use of urinary creatinine as a reference base probably assures the most consistently dependable results.

In the interest of practicability the standards presented here were initially formulated for a 6-hour collection period. Ordinarily, the examinees are requested to void urine at midnight, and the morning sample at 6 a.m. is collected. If a timed sample is not obtained, the morning sample representing a reasonably long collection period will be the most suitable and possibly will be less influenced by variations in nutrient intake at meal times. Timed samples

have generally proved impractical in the field and most of the data collected on surveys by ICNND teams have been interpreted on the basis of creatinine reference. The values presented in table 3 were based upon an expected creatinine excretion of 1.5 gm. per 24 hours for the "standard" man weighing 65 kg. Studies on the use of casual urine specimens in evaluating excretion rates of thiamine, riboflavin, and N'-methylnicotinamide (34-36) demonstrate that this method, although not ideal, is useful in nutrition surveys.

*N'-methylnicotinamide.* The values in the deficiency range of 0.2 mg. per 6 hours or 0.5 mg. per gram of creatinine are based largely upon the work of Goldsmith and co-workers (11,37). Such levels were found in subjects receiving approximately 5 mg. of niacin and 200 mg. of tryptophan daily at the time they developed clinical symptoms of pellagra. At slightly higher tryptophan intakes (250 to 300 mg.) similar levels of excretion have been observed in some subjects without the development of clinical symptoms (12).

The excretion of niacin metabolites increases rapidly with intakes above 8 to 10 mg. per day (11), and excretions in the acceptable range are compatible with intakes of 12 to 16 mg. per day (38) on an average hospital diet (12).

Some normal individuals apparently fail to excrete appreciable amounts of N'-methylnicotinamide in the postabsorptive state. Large excretions have been noted in prolonged fasting or muscle wasting. The wide deviations observed in subjects given the same diet in the studies referred to previously should be noted.

The interplay of tryptophan and niacin metabolism is well known and a multiplicity of end products result. For practical reasons, surveys in the field are usually limited to a measurement of N'-methylnicotinamide. Analysis for a more extensive series of end products might yield more precise information.

*Riboflavin.* Extensive studies upon the urinary excretion of riboflavin at different levels of intake are available. Excretions of the order of 50 micrograms (mcg.) per day have been associated with clinical symptoms of deficiency (16) and the urinary excretion is about 10 percent of the intake up to an intake of approximately 1.1 mg. per day. Excretion then rises rapidly at higher intakes and may amount to approximately 30 percent of the intake. Thus, excretions between 50 mcg. per day (10 to 12 mcg. per 6 hours) and 120 mcg. per day (30 mcg. per 6 hours) apparently represent unsaturation. Such factors as negative nitrogen balance and physical activity may be associated with variations in excretion. Individual variation in excretion is itself relatively great, as is the variation from sample to sample on the same individual. As has been indicated in the discussion of dietary standards, there is need to determine the applicability of these values to dietary and environmental conditions other than those under which they have been obtained (37, 39).

A word of warning is germane regarding application of these particular standards to nutrition survey data. These levels of riboflavin excretion were derived from a study in which a specific riboflavin method was employed. They cannot legitimately be applied to the interpre-

**Table 3. Suggested guide to interpretation of urinary vitamin excretion data for physically active young adult males**

Urinary metabolite	Deficient	Low	Acceptable	High
N'-methylnicotinamide:				
mg./6 hours.....	<0.2	0.2-0.59	0.6-1.5	≥1.6
mg./gm. creatinine.....	<.5	0.5-1.59	1.6-4.2	≥4.3
Riboflavin:				
mcg./6 hours.....	<10	10-29	30-99	≥100
mcg./gm. creatinine.....	<27	27-79	80-269	≥270
Thiamine:				
mcg./6 hours.....	<10	10-24	25-49	≥50
mcg./gm. creatinine.....	<27	27-65	66-129	≥130

NOTE. The urinary values are based on an average creatinine coefficient of 23 and a man weighing 65 kg., who would be expected to excrete 1.5 gm. of creatinine per 24 hours.

tation of data obtained by other less specific methods of analysis. This comment applies generally to attempts to apply any of the "standards" which are here proposed; methodological comparability is essential or erroneous conclusions may be drawn. The standards only apply when the appropriate experimental techniques are used.

**Thiamine.** Thiamine excretion is apparently related linearly to intake except at very low levels, although the curves obtained in different laboratories have not been comparable. The relation to clinical symptoms is less clear. Excretion may also be characteristic of an individual (37). Intakes of 0.2 mg. per 1,000 calories have been associated with excretions of 5 to 20 mcg. or less per day (40, 41) and an excretion of 40 mcg. per day with intakes of 0.35 mg. per 1,000 calories (42). On the basis of these controlled experiments, the standards for urinary excretion appear somewhat generous relative to the proposed dietary standards for thiamine, but are supported by results from survey data (43). Excretions above 100 mcg. per day are not considered to be compatible with deficiency (44).

### Blood and Serum Analysis

**Hemoglobin and hematocrit.** According to Wintrobe (45), the average hemoglobin value for normal young men should be 16 gm. percent and the corresponding hematocrit should be 47 percent. Values from 14 to 18 gm. percent for

hemoglobin and 40 to 54 percent for hematocrit are considered to be within the normal range. Milam and Muench (46) found for white adult males in North Carolina average hemoglobin values of  $14.25 \pm 1.2$  gm. percent and 95 percent of the distributions to be between 11.88 and 16.62 gm. per 100 ml. Values for Negroes in the same region were slightly lower. The values in table 4 have been proposed as lower limits based upon these data as obtained from occidental peoples. A correction for the effect of altitude (47) is also proposed. Such corrections have been made in hemoglobin data obtained during the ICNND surveys in Ethiopia and in Peru. The occurrence of low hemoglobin levels is not a sufficient criterion for the diagnosis of iron deficiency without further characterization of the anemia. Parasitism must always be considered as a possible factor, and race and altitude may also require consideration.

Women normally have hemoglobin levels 1 to 1.5 gm. lower than men. Children under 14 years also have levels below the levels found in men and these normally vary with age. Pregnant women normally exhibit hemoglobin concentration changes which vary with the different stages of pregnancy. The standards proposed for men do not apply to women and children.

**Serum proteins.** The values proposed for serum protein levels also represent somewhat arbitrary figures based upon the distribution of serum proteins in normal persons (48). In

Table 4. Suggested guide to interpretation of blood data for physically active young adult males

Blood constituent	Deficient	Low	Acceptable	High
Hemoglobin (gm./100 ml.):				
Sea level.....	<12.0	12.0-13.9	14.0-14.9	>15.0
5,000 feet (1,500 M.).....	<12.3	12.3-14.2	14.3-15.5	>15.6
12,000 feet (3,700 M.).....	<13.3	13.3-15.4	15.5-17.1	>17.2
14,000 feet (4,500 M.).....	<14.4	14.4-16.7	16.8-18.9	>19.0
Hematocrit (percent):				
Sea level.....	<36	36-41	42-44	>45
5,000 feet (1,500 M.).....	<38	38-43	44-46	>47
12,000 feet (3,700 M.).....	<42	42-48	49-55	>56
14,000 feet (4,500 M.).....	<46	46-52	53-64	>65
Total serum protein (gm./100 ml.).....	<6.0	6.00-6.39	6.4-6.9	>7.0
Serum ascorbic acid (mg./100 ml.).....	<10	0.10-0.19	0.20-0.30	>.40
Serum vitamin A (mcg./100 ml.).....	<10	10-19	20-19	>50
Serum carotene (mcg./100 ml.).....	( <sup>1</sup> )	20-39	40-99	>100

<sup>1</sup> See discussion of carotene in text under Blood and Serum Analysis.

view of the many factors associated with nutritional edema (33) other than the serum protein level, a close correlation with the occurrence of edema cannot be expected. The total serum protein may be normal, but the albumin to globulin ratio may be abnormal because of an elevated globulin (49,50). If protein malnutrition is suspected, the measurement of serum albumin is indicated (51).

*Ascorbic acid.* Voluminous data show that the serum ascorbic acid level generally reflects the dietary intake. The absence of measurable ascorbic acid from the serum is compatible with scurvy, but is not diagnostic. Clear-cut evidence of malnutrition or ill health due to lack of ascorbic acid when serum levels are above 0.2 mg. per 100 ml. is lacking (21-23). Serum levels of ascorbic acid will stabilize at different intake levels (52-54). In view of the wide variations in ascorbic acid content of different samples of the same food and the variable losses in preparation and storage, the serum levels may be considered as more satisfactory evidence of ascorbic acid status than dietary data.

Although one cannot ignore the effect of various kinds of stress such as surgery, trauma, and illness in altering the serum ascorbic acid level, much of this stress effect is due to a concomitant reduction of dietary intake.

*Vitamin A.* In surveys of presumably well-nourished individuals most serum vitamin A levels are found to fall between 30 and 50 mcg. (100 to 160 I.U.) per 100 ml. with a few values between 20 and 30 mcg. (66 to 100 I.U.) and some above 50 mcg. per 100 ml. of serum (55). (One I.U. is equivalent to 0.3 mcg. of vitamin A alcohol, or 0.344 mcg. of vitamin A acetate (56).) In controlled studies in which adults were fed a vitamin A-free diet (25) the serum levels gradually decreased over many months to approximately 10 to 40 I.U. (3 to 12 mcg.) per 100 ml. It has been stated that evidence of night blindness usually appears when the serum level is between 50 and 66 I.U. (15 and 20 mcg.) per 100 ml. (55). However, Hsu (57) did not find clinical deficiency signs until the vitamin A serum level reached 6 I.U. per 100 ml. In Indonesia de Hass and co-workers, investigating xerophthalmic infants and children, found serum values of 7.0 to 10.3 I.U. of vitamin A in contrast to values of 12.2 to 26.9 I.U. in sim-

ilarly aged subjects without xerophthalmia (58). Yarbrough and Dann (59) studied dark adaptation and blood vitamin A in a nutrition survey in North Carolina and found that although the blood levels ranged from 7 to 101 I.U. per 100 ml., 96.7 percent of their subjects had normal vision. Most workers will probably agree that a level of 50 I.U. (15 mcg.) per 100 ml. represents no serious depletion. It is suggested that a finding of 5 percent or more of the subjects with levels below 33 I.U. (10 mcg.) or 15 percent below 66 I.U. (20 mcg.) per 100 ml. is evidence of vitamin A deficiency in a population.

In view of the considerable storage of this vitamin in the body, the long time required for depletion, and the seasonal distribution of vitamin A food sources which often occurs, little correlation of blood data with dietary studies can be expected in many areas. Considerable reliance must thus be placed upon the biochemical and clinical evidence. More data upon the serum vitamin A levels in areas where vitamin A deficiency is an actual problem are needed.

*Carotene.* Nutritional status with regard to vitamin A cannot be evaluated from serum carotene levels alone. The level in the serum reflects the recent dietary intake and gives useful information concerning food habits, particularly in areas where the intake of preformed vitamin A is low. The values for serum carotene in well-nourished men fluctuate widely. Gillum and co-workers (60) found values which ranged from 25 to 405 mcg. per 100 ml. with a mean value somewhat over 100 mcg. The values proposed are considerably lower than those suggested by Bessey and Lowry (61) and Sinclair (62), but are similar to those suggested by the data of Williams (63) and Clayton (64).

## Discussion and Conclusion

Most of the data upon which these provisional standards are based have been obtained in the United States and Europe, generally in controlled experiments. The effect of other environmental factors and the possible interrelationships between nutrients are relatively unexplored. It may be expected that data obtained from nutrition surveys in various parts



of the world which are assessed by uniform methods will contribute materially in this area. In other words, the application of these provisional standards to survey data provide a practical appraisal of the validity of the standards themselves. No nutrition standards can be considered as final or fixed at this time, and the quantity and quality of the work upon which they are based is variable. Thus, they are considered as working standards with the expectation that they will be modified as the justification becomes apparent.

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NOTE: References to the ICNND Manual for Nutrition Surveys and reports of surveys in each of 12 countries are cited on pages 685-686.

## Juvenile Delinquency "Facts and Facets"

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# Relations of Clinical and Dietary Findings in Nutrition Surveys

IRVIN C. PLOUGH, M.D., and EDWIN B. BRIDGFORTH, A.B.



An objective of the nutrition survey program of the Interdepartmental Committee on Nutrition for National Defense (ICNND) is the appraisal of the nutritional status of population groups.

The ICNND survey teams have studied military populations as a whole and have used three general approaches (1). Large numbers of individuals were examined clinically, and biochemical studies were performed on a subsample. Food and nutrient intakes were determined both in military messes and in households.

Although the three survey methods, clinical, biochemical, and dietary, require quite different procedures, one would expect them to give the same general results in the evaluation of nutritional status. Interrelations may be limited by the fact that the three approaches measure different temporal aspects of nutriture. The diet survey gives present intake, biochemical studies, that of the recent past, and clinical examination tends to give a history of a longer

period in the past. Attempts were made in individual survey reports for the Philippines and Spain to correlate the results of the three approaches, but with little success. One difficulty was that the dietary nutrient intake figures, the incidences of clinical findings, and the means of the biochemical results showed little variation within each survey. It is therefore of interest to combine the data from a number of surveys and look for interrelations within the whole. Such a study should allow an evaluation of the reliability of the data and perhaps also of the survey technique. Integration of all findings might also lead to other results, for example, a better evaluation of human dietary requirements.

## Methods

The data used in this analysis were taken from reports of nutrition surveys in Iran, Pakistan, Korea, the Philippines, Turkey, Libya, Spain, and Peru, published by the Interdepartmental Committee on Nutrition for National Defense. Several of these reports have also been published in scientific journals, although in somewhat less detail. The material analyzed here comprises results of surveys of military populations only, since military feeding practices permit the application of dietary survey procedures to large homogeneous groups. Thus, the average calculated nutrient intakes in military messes should approximate the in-

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takes of individuals more exactly than can be expected in surveys of households.

The mess surveys were done by either the food inventory or recipe method. From the weights of food items consumed per man per day the nutrient intakes were calculated from tables of food composition, with major reliance on the U.S. Department of Agriculture Handbook No. 8 (2) and the U.N. Food and Agriculture Organization's tables of food composition (3). In many surveys composite food samples were also taken for chemical analysis for nutrient composition. Analyzed values for nutrients were used where possible except for vitamin C. In the latter instance calculated values were used because of the lability of vitamin C in stored samples and because of the frequent presence of interfering substances, particularly in cooked foods.

Large numbers of men were examined for clinical evidence of nutritional deficiency. Systematically selected men from those examined clinically also had blood and urine samples taken for biochemical analysis. Further details of the survey procedure are given in the individual survey reports and the ICNND Manual for Nutrition Surveys.

In the 8 nutrition surveys analyzed, a total of 58 military kitchen surveys were completed in 57 locations. The clinical and biochemical data analyzed were obtained on those subjects examined at these 57 separate locations. The groups included men from the messes surveyed and persons in the same location who ate in other messes. In analyzing the data it was necessary to assume that the nutrient intakes measured in one mess were representative of all mess halls at that location. Food for these messes was generally obtained locally so this assumption seemed reasonable. Thus, 57 sets of more or less complete data were selected which included nutrient intakes and clinical and biochemical findings in regard to these nutrients. The U.S. Army Medical Research and Nutrition Laboratory will publish detailed tabulations of these data, together with graphic correlations between dietary, clinical, and biochemical results.

Examination of the study data revealed reasonable homogeneity within each country. The findings in each nation were therefore

averaged to give eight sets of data, parts of which are presented in the table. Unfortunately, only five sets of biochemical data are available because of varying methods of presentation. In taking the averages, the clinical and biochemical findings were weighted for the number of men in each group. Unweighted arithmetic means were taken of the dietary data, because no decision could be made, *a priori*, whether to weight the averages by the number of men fed in the mess, by the number of men examined in that location, or in some other way.

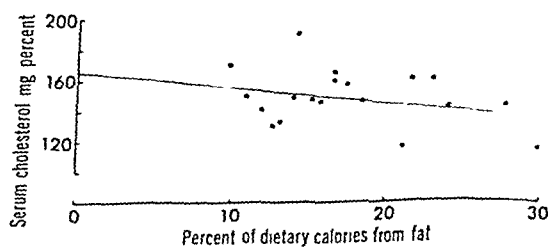
The data presented in the figures include both those from particular locations within countries (filled circles) and the national averages (open circles). Linear regressions were calculated for several sets of data, and in one case a hyperbolic regression was derived after reciprocal transformation of the independent variable. The regressions were calculated from the national figures alone.

## Results

The survey results were compared in three general ways: dietary vs. clinical findings, dietary vs. biochemical findings, and clinical vs. biochemical findings. In addition, a few correlations were attempted between selected clinical findings. These various comparisons are described under the headings of individual nutrients.

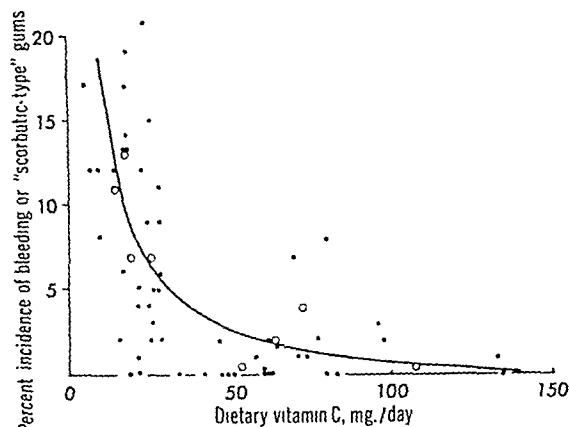
*Calories and macronutrients.* No correlations were noted between caloric intake and height, weight, percent of "standard weight," or skinfold thickness. There was no interrelation of body weight or percent of "standard weight"

Figure 1. Relation of the serum cholesterol level to the percent of calories in the diet obtained from fat



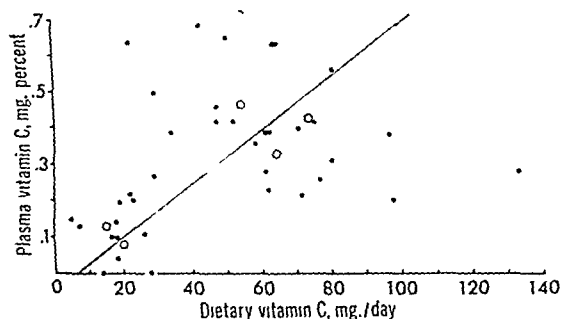
NOTE: The line has the equation,  $Y=166-X$ .

**Figure 2. Relation of the incidence of bleeding or "scorbutic-type" gums to the dietary intake of vitamin C**



NOTE: The curve has the equation,  $Y=202/X^{-1.3}$ .

**Figure 3. Relation of the plasma vitamin C level to the dietary intake of vitamin C**



NOTE: The line has the equation,  $Y=0.007X-0.045$ .

with the skinfold thickness. Neither caloric intake nor the parameters of body composition correlated with any of the clinical or biochemical findings. The level of serum protein did not appear to be related to dietary protein intake. A slight negative correlation was observed between dietary fat, expressed as percent of caloric intake, and serum cholesterol level (fig. 1). The equation for the regression line relating these two was  $Y=166-X$ .

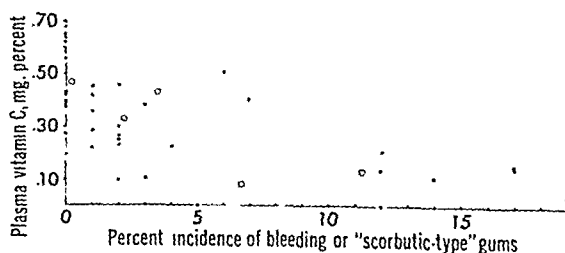
**Vitamin C.** Clinical findings of bleeding gums or diffusely swollen, dusky, friable gums (recorded as "scorbutic-type") correlated well with the measured dietary intake of vitamin C (fig. 2). The individual mess survey data showed a rather definite cutoff point at about 30 mg. of vitamin C per day, below which an increased incidence of lesions occurred. The mean values for the eight nations showed a more

regular progression, described by the equation:  $Y=202/X^{-1.3}$ .

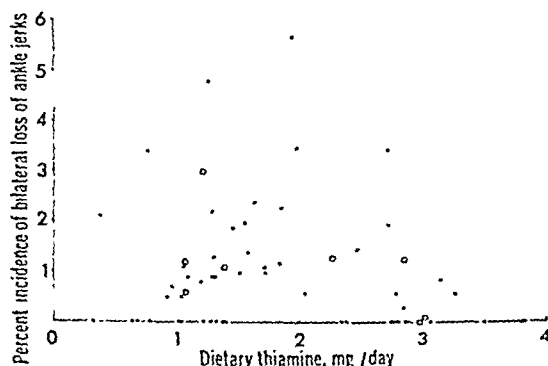
Dietary vitamin C intakes also correlated reasonably well with the plasma level of the vitamin in the five nations for which data are available (fig. 3). The regression equation relating these two variables was  $Y=0.007X-0.045$ . The plasma vitamin C level was also negatively correlated with the gingival lesions of swollen, dusky, friable, or "scorbutic-type," gums (fig. 4). Other gingival findings, such as marginal redness and swelling, or recession of the gums, were also slightly correlated with dietary and plasma levels of vitamin C.

**Thiamine.** Bilateral loss of ankle jerk was not correlated with dietary intake of thiamine (fig. 5), although the urinary excretion of the vitamin was related to the estimated intake of thiamine (fig. 6). The regression equation for the latter two variables was  $Y=133X-45$ . No correlations were found between other clinical findings, such as calf tenderness or ankle edema, and dietary thiamine, or between these clinical signs and urinary thiamine excretion.

**Figure 4. Relation of the plasma vitamin C level to the incidence of bleeding or "scorbutic-type" gums**



**Figure 5. Relation of the incidence of loss of ankle jerk to the dietary intake of thiamine**



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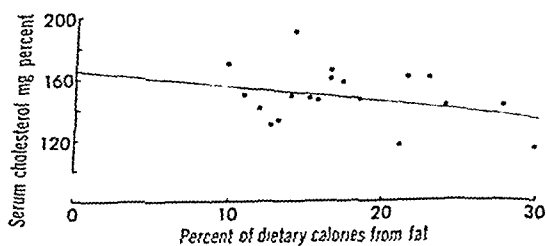
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urinary excretion of N'-methylnicotinamide appeared to be related to the dietary intake of niacin (fig. 9), although most of this correlation was contributed by the low excretion rates of the Libyan survey.

*Vitamin A.* No correlations were evident between dietary intake of vitamin A and the incidences of follicular hyperkeratosis, either generally or on specific parts of the body, or of Bitot's spots, nor did dietary vitamin A correlate with serum vitamin A or carotene.

*Iron.* No relations could be discerned between dietary intake of iron and the incidence of the various lesions of the tongue, or between dietary iron and hemoglobin levels, hematocrit, or mean corpuscular hemoglobin concentration.

### Discussion

It might be expected that the three general approaches to assessment of nutritional status would give results in individuals or population groups that would compare reasonably well with each other. It should be pointed out, however, that the present assessment procedures have many inherent sources of error. The most obvious errors in clinical examination procedure are the different criteria for diagnosis of a lesion employed by the examiners in the Philippines and Spain although this can be reduced by discussion among examiners and by test exercises in standardization. It is also recognized that a physician's judgment may change unconsciously with time during a given survey. Such examiner differences are likely to be especially great when the population surveyed has lesions of mild degree, as was the case in these nutrition surveys.

As noted previously, the dietary survey results can be misleading as a result of using average figures. Individuals may consume specific nutrients in quantities differing widely from the average consumption. Biochemical data are often claimed to be the most accurate, but these suffer, as do the clinical and dietary results, from errors in sampling, and the average values employed here restrict their usefulness in depicting variations in the nutritional status of the population.

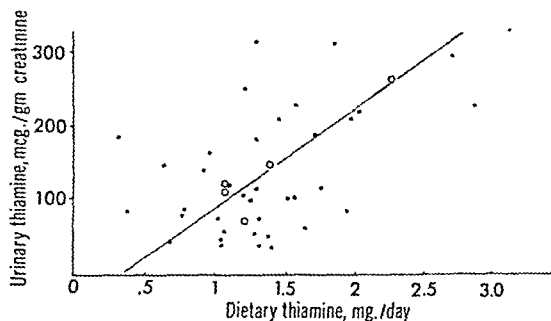
Another basic problem is that the three approaches measure different chronological as-

pects of nutritional status. The dietary survey notes the average nutrient intakes at the time of the survey. Although the measured intakes may be satisfactory, they may not have been so in the past, and vice versa. The biochemical results reflect the nutrient accumulation by individuals in the relatively recent past. This interval varies for different nutrients. Body stores of vitamin C are relatively small, so that concentrations of ascorbic acid in the blood reflect the intake during the preceding few weeks (4). However, large amounts of vitamin A may be stored, and the level of this vitamin may remain satisfactory despite 2 years or more of restricted intake (5) of vitamin A and beta-carotene. For development of discreet clinical findings of avitaminosis an even longer period sufficient for exhaustion of particular tissue stores is probably required. Furthermore, once a lesion has been produced, it may require much time to revert to normal, especially on dietary intakes which are only slightly above the body's requirement. Indeed, some lesions or their sequelae may be permanent.

In regard to total food consumption, one would expect correlations between intake and body weight or body size to be masked by the large variations produced in caloric requirement by different levels of activity. Reference of the measured body weight to a standard for height might be expected to uncover a correlation with intake. Unfortunately, the standard weight table widely employed (6) depicts for a given height a regular increase in weight with age. This reflects the American population of 1912, from which the table was calculated. There is, however, no valid reason to assume that after the early twenties an individual should gain weight, presumably fat, with each year of age. This problem arising from the use of the standard weight table can cause difficulty in interpretation of survey results, as illustrated by the age-height-weight data from the Philippines (see table). The mean age was 30 years and there was an age-specific mean percent of "standard weight" of 90.8. If the observed height and weight are used and one enters the standard weight table at age 22, the mean age of the other populations surveyed, the percent of "standard weight" is 93.0, more comparable with the other results. Problems of this

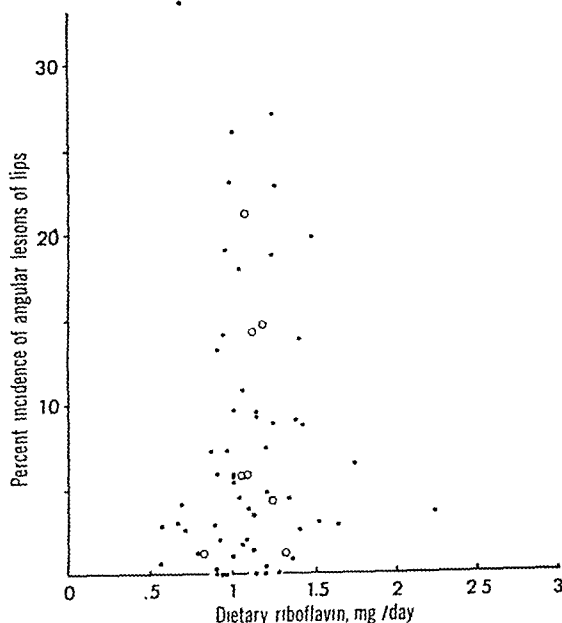


**Figure 6. Relation of the urinary excretion rate of thiamine to the dietary intake of thiamine**



NOTE: The line has the equation,  $Y=133X-45$ .

**Figure 7. Relation of the incidence of angular lesions of the lips to the dietary intake of riboflavin**



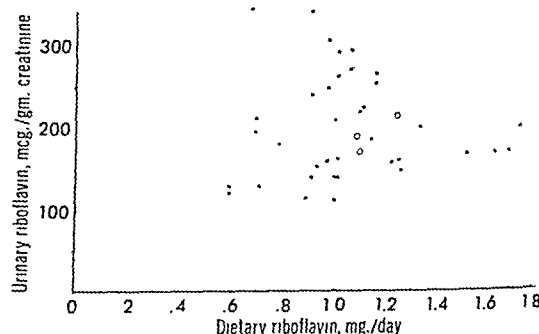
**Riboflavin.** No clinical findings could be correlated with dietary intake of riboflavin. The signs tested included circumcorneal injection, nasolabial seborrhea, angular scars of the lips, angular lesions, cheilosis, filiform papillary atrophy of the tongue, papillary hypertrophy, fissures, red tip or margins of the tongue, magenta tongue, geographic tongue, and scrotal dermatitis. As an example, the incidences of angular lesions of the lips versus dietary riboflavin are presented (fig. 7). A combined scoring procedure was also set up using the four signs, circumcorneal injection, angular lesions,

magenta tongue, and scrotal dermatitis. The incidence of each sign was weighted in inverse proportion to its overall incidence in the eight surveys. However, the sum of the weighted incidence rates again did not correlate with the dietary intake of riboflavin.

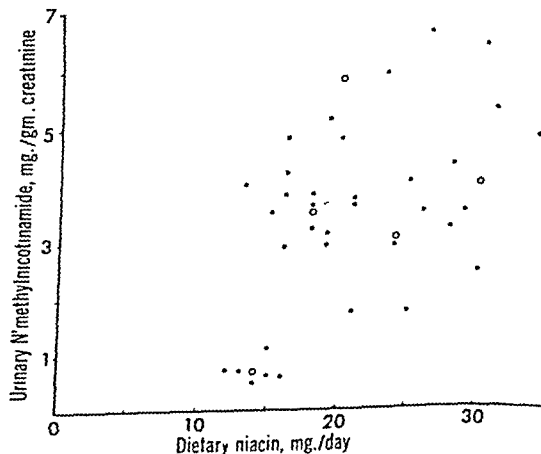
The urinary riboflavin excretion did tend to be related to the dietary intake of the vitamin (fig. 8), but the red blood cell riboflavin, measured only in the surveys in Spain and Peru, did not.

**Niacin.** Clear-cut cases of pellagra were not found in any of the eight surveys, and the lesions of thickened, pigmented pressure points and hyperpigmentation of the skin did not correlate with dietary intake of niacin. The

**Figure 8. Relation of the urinary excretion rate of riboflavin to the dietary intake of riboflavin**



**Figure 9. Relation of the urinary excretion rate of N'-methylnicotinamide to the dietary intake of niacin**



sort explain, in part, the lack of correlation between percent of "standard weight" and the measurements of skinfold thickness, both of which should vary with the amount of body fat, despite genetic and perhaps environmental influences.

The lack of correlation between dietary protein intake and serum protein levels is explained by the fact that no prolonged critically low protein intakes occurred. The negative correlation observed between dietary fat, expressed as percentage of caloric intake, and serum cholesterol is opposite to that reported in many studies. Perhaps this is fortuitous since other factors, such as degree of saturation of dietary fat, were not evaluated, and much of the fat was of vegetable origin.

The best correlations observed here were between dietary vitamin C intake, plasma vitamin C, and clinical findings in the gums. These observations support the known fact that plasma vitamin C rather quickly reflects dietary intake, and suggest that the gingival lesions are relatively labile clinical findings.

Although none of the clinical signs usually related to thiamine deficiency correlated with dietary intake of thiamine, only one finding, the incidence of loss of ankle jerk, was reported in enough individuals to permit a good comparison. This abnormality can occur unrelated to thiamine deficiency, and is known to increase with age. This is also one of the signs that may not readily be reversed.

The lack of correlation between any of the clinical signs and dietary riboflavin intake is unexpected, particularly since riboflavin is not considered to be stored in the body to any appreciable extent. One explanation may be that very few extremely low intakes of the vitamin were found. Another explanation may lie in the nonspecificity of the indicator lesions.

The definite correlation between urinary thiamine excretion rate and thiamine intake indicates that within wide limits, and in large groups, one can be used as a measure of the other. Although the urinary riboflavin and N'-methylnicotinamide excretion rates may be slightly correlated with intakes of riboflavin and niacin, respectively, prediction of one from the other, even with large groups, would be hazardous. The fact that excretion rates of

riboflavin were never seen below 100 mcg. per gram of creatinine suggests the presence of non-riboflavin compounds in the urine which interfered with the analysis. Better survey methods for the assay of riboflavin in urine are being developed.

The lack of any correlation between dietary intake of vitamin A and the blood level is doubtless explained by storage of the vitamin in the body during seasons when the intake is relatively high. The fact that there is no relation between the clinical findings and blood levels may reflect either nonspecificity of the lesions or the long time needed for development of the lesions, or the failure to encounter a population sufficiently depleted to have developed clinical signs of avitaminosis.

The average values of clinical, biochemical, and dietary findings for a national survey tend to intercorrelate better than do values for individual groups. Apparently, the limitations of the methods are not so great that they cannot be reduced by an increase in the size of the sample, especially when large national differences in intakes occur.

Data such as these relating dietary intake of a nutrient to the incidence of clinical findings due to deficiency of that nutrient may be used to appraise the human requirement. Indeed, the data for vitamin C do show a marked increase in gingival findings at intakes below 30 mg. per day, the value used in the United Kingdom as the human requirement. For other nutrients, however, the distributions show little that can be used with confidence to estimate the body's requirement.

Another study of nutrition survey results may be made by grouping the data and presenting percentage distributions based on ranges of values considered to be "low" or "high." Tentative ranges of "deficient," "low," "acceptable," and "high" have been set forth in the ICNND Manual for Nutrition Surveys. The biochemical data were tabulated in this manner in all of the survey reports. Comparisons were made between the biochemical data in this form and the clinical and dietary findings. The results were essentially similar to those reported here, using the mean biochemical values. A different type of transformation of the dietary data was also tested, namely, the expression of

# Mean clinical, biochemical, and dietary findings in eight nutrition surveys

	Clinical findings							
	Iran	Pakistan	Korea	Philippines	Turkey	Libya	Spain	Peru
Number of examinations.....	1,730	1,568	1,365	433	1,431	538	1,985	1,315
Age (years).....			25	30	22	24	22	21
Height (inches).....			64.6	63.9	65.6	66.4	64.8	63.5
Weight (pounds).....			129.3	121.2	142.2	133.7	135.5	133.7
Percent of "standard weight".....	99.3		96.7	90.8	105.5	95.8	102.5	105.9
Skinfold thickness, arm (mm.).....			5.5	6.7	7.0		9.9	9.0
Bitot's spots (percent).....			.3	.2	.2	.0	.1	.0
Angular lesions of lips (percent).....	14.6	.8	14.2	1.3	21.3	5.8	4.7	4.3
Cheilosis (percent).....	3.4	.3	1.9	2.0	27.4	.2	11.3	2.4
Atrophy of filiform papillae of tongue (percent).....	6.9	.3	1.2	3.1	9.0	.4	1.2	1.6
Glossitis (percent).....			.1	.0	.9	.0	.0	.1
Magenta tongue (percent).....			1.0	.0	.1	.2	.6	.1
Marginal redness or swelling of gums (percent).....	21.9	25.3	21.6	12.9	32.9	45.3	13.8	22.9
Bleeding or "scorbutic-type" gums (percent).....	13.0	6.6	.4	.2	11.3	6.7	2.2	3.5
Follicular hyperkeratosis (percent).....	31.7	33.4	4.2	2.2	19.4	11.9	23.0	20.5
Scrotal dermatitis (percent).....				1.2	1.6	.9	.1	.2
Thickened pressure points (percent).....				11.3	.1	.9	.0	.3
Hyperpigmentation (percent).....				.2	.3	5.9	.2	.3
Loss of ankle jerk (percent).....	1.3	.0	.1	1.2	1.3	3.0	1.1	.6
Calf tenderness (percent).....			.1	.1	.8	.4	.3	1.8
Ankle edema (percent).....	.6	.0	.1	.1	.2	.0	.0	1.1
	Biochemical findings							
	Iran	Pakistan	Korea	Philippines	Turkey	Libya	Spain	Peru
Number of determinations.....	410	409	271	96	277	142	481	260
Hemoglobin (gm. percent).....				14.4	15.0	14.7	15.5	14.3
Serum vitamin A (mcg. percent).....				46	35	33	37	37
Serum carotene (mcg. percent).....				72	59	153	79	71
Serum vitamin C (mg. percent).....				.47	.03	.08	.33	.43
Serum cholesterol (mg. percent).....				170	191		148	138
Urinary thiamine (mcg./gm. creatinine).....				110	265	73	147	126
Urinary riboflavin (mcg./gm. creatinine).....				148	172	192	279	217
Urinary N'-methylnicotinamide (mg./gm. creatinine).....				5.8	4.0	.7	3.5	3.0
	Dietary survey findings <sup>1</sup>							
	Iran	Pakistan	Korea	Philippines	Turkey	Libya	Spain	Peru
Number of mess surveys.....	5	9	4	9	7	6	11	7
Total number of rations.....	25,000	8,000	17,000	3,100	27,000	3,700	24,000	6,500
Calories.....	3,860	3,510	3,790	2,740	3,670	3,170	3,290	3,060
Protein (gm.).....	137	91	128	100	120	96	109	120
Fat (gm.).....	*74	*106	*43	20	*59	*80	74	52
Vitamin A (I.U.).....	*3,760	*2,900	*1,220	2,340	2,060	1,660	*1,680	4,360
Thiamine (mg.).....	*2.86	*2.98	*3.02	1.09	2.29	1.22	1.40	1.08
Riboflavin (mg.).....	*1.18	*1.32	*1.11	.83	1.09	1.08	1.07	1.24
Niacin (mg.).....	*34	*26	*21	20	*30	14	18	24
Vitamin C (mg.).....	*18	*26	*108	*54	*15	*20	*64	*73
Iron (mg.).....	*35	*21	*34	24	50	12	72	67

<sup>1</sup> Composition from chemical analysis except for values marked with an asterisk.

# Methods Used in Dietary Survey of Civilians in Ecuador

GERALD F. COMBS, Ph.D., and ALVIN C. WOLFE, Ph.D.



Dietary studies constitute an essential part of any complete nutrition survey. Populations which for extensive periods subsist on dietary intakes marginal in protective nutrients may fail to reveal any recognized specific nutritional deficiency lesions, and, at the same time, have a relatively low life expectancy, lowered physical and mental health, increased disease rates, and other manifestations of ill health. Under such conditions, where clinical observations are insensitive for detecting basic nutritional problems, nutrient intake studies are essential.

Reliable information concerning food and nutrient intakes in civilian populations is generally more difficult to obtain during a short period of time than in institutional or military feeding situations. Since small family units rather than large mess units are involved, a much longer survey period is needed to obtain reliable data on a comparable number of people, if the same methods and procedures are employed. The fact that different members of the family (adults, children, infants, and pregnant or lactating women) have different nutrient requirements is still another difficulty.

It has been necessary in such studies, there-

fore, either to obtain good information on a few individuals or to adopt less accurate procedures which give some information about a large number of people in a short period of time. Very little information exists concerning the relative reliability of these different approaches. Such comparisons were made during the Interdepartmental Committee on Nutrition for National Defense (ICNND) survey of the nutritional status of the armed forces and civilians in Ecuador during the summer of 1959 (1). Data on civilians were obtained by a relatively small number of team personnel, using three different dietary survey methods, each based on the family unit and designed to give nutrient intake data. Military messes were surveyed by two methods.

## Methodology

Two dietary teams, each consisting of one American nutritionist, two trained Ecuadorian female encuestadoras (interviewers), and one Ecuadorian male interpreter, obtained food intake data for 341 families including 2,087 people by the 24-hour recall questionnaire method and for 28 of these families by the recipe and food composite analysis methods. This was part of a total ICNND survey involving clinical, biochemical, and dietary assessment of their nutritional status. The survey was accomplished during a 7-week period concurrently with or

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*Dr. Combs is professor of poultry nutrition, University of Maryland, and Dr. Wolfe is associated with the General Tire and Rubber Co., Akron, Ohio.*

nutrient intakes per 1,000 calories. This transformation did not improve any of the correlations with the clinical or biochemical findings.

These results do not invalidate the nutrition survey procedures. They do, however, indicate the relative value of the three different approaches and suggest areas requiring improvement. The detailed and laborious mess survey must remain a standard of reference, although the results are necessarily limited to the period of the survey. The clinical survey is the easiest to perform and, theoretically, should give the measure of nutriture since health, not a specific level of nutrient intake, is the goal of nutritional preventive medicine. As the data show, many errors would be introduced if one relied on the clinical findings alone. The biochemical survey also approaches the evaluation of health with more specificity than clinical examination, but as yet even field methods are difficult to carry out; furthermore, they are not available to test many aspects of nutritional status, nor is it possible to observe large numbers of persons with this method.

But nutrition surveys are not designed for the sole purpose of detecting deficiencies. They are intended to provide an appraisal of nutritional level—to give information on food use, nutrients consumed, and sources of nutrients; to indicate whether these observations on diet at a given moment do in fact reflect the usual intake level or pattern; to allow some appraisal of the probable clinical meaning of the cumulative effects of the nutritional level; and to relate these conclusions practically to needs of the country or region toward an improved state of health. When so examined with due consideration of the known physiology of nutrition, findings such as those studied here are exceedingly useful indicators of intake levels, and their meaning for nutritional planning toward better health is increased.

## Summary

Data on nutrient intakes were selected from 58 mess surveys in 57 military messes in 8 nations in which nutrition surveys of the military were performed by a standard technique under

the auspices of the Interdepartmental Committee on Nutrition for National Defense. These mean data were compared with the clinical and average biochemical findings in troops from the same locations.

The clinical and biochemical findings relating to vitamin C nutriture correlated well with the dietary intakes. The urinary excretion rates of thiamine, riboflavin, and N'-methylnicotinamide correlated roughly with the dietary intakes of thiamine, riboflavin, and niacin, respectively, but the clinical findings widely held to reflect an insufficiency of these vitamins showed scarcely any correlation with dietary intakes. No apparent correlations could be found between the three survey approaches in vitamin A or calorie nutriture. An apparent negative correlation was noted between fat intake and serum cholesterol.

Sources of errors in the interpretation of these findings are identified and discussed. With appropriate recognition of the limitations of each type of evidence and appreciation of nutritional physiology, useful appraisals of nutriture are possible.

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NOTE: References to the ICNND Manual for Nutrition Surveys and reports of surveys in each of 12 countries are cited on pages 685-686.



Skin-thickness reading at Juan Montalvo School, Portoviejo, Ecuador, during nutrition survey

obtain specific information concerning family income, beliefs concerning foods, and practices of feeding babies and young children.

The food intake data, by families, were summarized by areas according to geographic location. Three of these were on the coast and five in the Sierra region of Ecuador, each summary contributing a minimum of 25-family survey questionnaires. The average amounts of each food item consumed per person per day were used to calculate the average intake of various nutrients per person per day, using tables of nutrient composition prepared by the National Institute of Nutrition of Ecuador (3). U.S. Department of Agriculture Handbook No. 8 (4) was used for data pertaining to foods not included in the local tables.

*Recipe method.* For this method the enuestadoras obtained the weights of the edible portion of each food consumed separately or used in the preparation of a particular recipe or dish. These were obtained after preparation waste, if any, was discarded but before the food was cooked. The weights of the prepared

foods were also determined after cooking, if the food was cooked. Although seldom encountered, any leftover foods not consumed also were weighed. From these data the average daily food and nutrient intake was calculated using the food composition tables mentioned above (3,4).

*Food composite analysis method.* Each prepared food item was weighed after cooking, if the food was cooked. Any food remaining after the meal also was weighed. From the weight of each prepared food consumed by each family, the average amount consumed per person was obtained. Samples of each prepared food, equivalent to approximately one-fifth to one-half of the amount consumed per person, were obtained at mealtime. From these samples, two food composites were prepared in which each food item was represented on the basis of the average amount actually consumed by each member of the household. One food composite sample was preserved with oxalic acid and the other with alcoholic potassium hydroxide.

Each food item was homogenized in a Waring

between dietary surveys conducted in nine military installations. Eight major locations in Ecuador were involved, including 29 specific locations where the 24-hour recall questionnaire method was used and 12 specific locations where the recipe and food composite analysis methods were used.

The design of the study made possible a direct comparison of the three different methods involving the same 28 families (184 people) and a comparison of the results obtained by each of these methods for the 28 families with those obtained by the 24-hour recall questionnaire method for all 341 families.

All three methods used in obtaining food intake data were restricted to 1 day's food supply (three consecutive meals) for the family or household. The nutrient intake was calculated on the basis of the average daily intake for each individual. Information was collected concerning age, sex, and number of lactating or pregnant women, in order to characterize adequately each family unit or group of family units. Heights and weights of individuals also were determined for most of the families surveyed by the recipe and food composite analysis methods.

Each encuestadora was able to collect data for the recipe and the food composite analysis methods in two households for the same three-consecutive-meal period. The selection of families or households to be surveyed by the recipe and food composite analysis methods, as well as the 24-hour recall by questionnaire, was accomplished through the help of local public health officials. In each instance a typical section of a village or part of a city was located, and nearby homes were selected at random just as the three-meal survey was to start. Households containing fewer than four people were not studied. In Guayaquil and in Quito, only areas representative of the lower economic stratum were selected. The location, date, number of families, and number of persons surveyed are given in table 1.

Since the information was collected on a family basis and the families varied markedly as to number of adults, number and age of children, sex, and number of pregnant or lactating women, it was necessary to calculate the allowances for calories and other nutrients by groups of families based on their specific composition

and location. The procedure for calculation of the calorie requirement of this mixed population differed from that suggested by the Food and Agriculture Organization (2) in that the proportional difference in body size was considered to apply to all age groups over 1 year of age instead of only to those over 16 years of age.

*Twenty-four-hour recall questionnaire method.* A questionnaire was completed by the Ecuadorian encuestadoras during an interview with the mother or equivalent of each family or household studied. Many of these were completed during interviews with women who had been examined clinically by other members of the survey group. Some were obtained at special clinics for pregnant and lactating women. Others were completed in the homes selected for the more detailed dietary studies.

This questionnaire included a listing of the quantities of specific foods consumed by the entire family or household during the previous day (24-hour recall). In addition, it included a section concerning frequency of use of various food items by the family, and was designed to

**Table 1. Location, date, number of families, and number of persons surveyed by three methods in 1-day food intake studies in Ecuador, 1959<sup>1</sup>**

Location	Date	Number of families	Number of persons
Esmeraldas			
Tabiazo.....	July 31	2	17
Santo Domingo....	Aug. 3	4	25
Ibarra			
Andrade Marin...	July 30	1	9
Chaltura.....	July 31	1	11
Ambato			
San Bartolome...	Aug. 7	2	15
Riobamba			
Guano.....	Aug. 10	2	17
Loja			
El Valle.....	Aug. 17	3	18
Cuenca			
Ricaurte.....	Aug. 12	2	8
Machala			
Guayaquil.....	Aug. 15	2	12
Jose Salcedo.....			
Delgado.....	Aug. 25	3	17
Santa Ana.....	Aug. 26	2	13
Quito.....	Sept. 2	4	22
Total.....		28	184

<sup>1</sup> Three methods used were recipe, food composite analysis, and 24-hour recall questionnaire.





# Dietary Questionnaire

CARD NO. \_\_\_\_\_ DATE \_\_\_\_\_

FAMILY NAME \_\_\_\_\_

TOWN \_\_\_\_\_ PROVINCE \_\_\_\_\_

ETHNIC GROUP \_\_\_\_\_ RELIGION \_\_\_\_\_

FATHER'S OCCUPATION \_\_\_\_\_

NUMBER IN HOUSEHOLD:

Total \_\_\_\_\_ Adults \_\_\_\_\_ Children \_\_\_\_\_

Number males over 16 years \_\_\_\_\_ Ages \_\_\_\_\_

Number pregnant women \_\_\_\_\_ Ages \_\_\_\_\_

Number lactating women \_\_\_\_\_ Ages \_\_\_\_\_

Number other women (over 16 years) \_\_\_\_\_ Ages \_\_\_\_\_

Number children (under 16 years):

Babies under 1 year \_\_\_\_\_

Breast fed. Yes \_\_\_\_\_ No \_\_\_\_\_

Number other boys \_\_\_\_\_ Ages \_\_\_\_\_

Number other girls \_\_\_\_\_ Ages \_\_\_\_\_

## QUESTIONS

- What is the total cash income for the family per week?
- How much is spent on food per week?
- How many times per week do you buy food?
- What are the main foods you buy?

Food item	Amount purchased per week	Value
_____	_____	_____
_____	_____	_____
_____	_____	_____

- Do you prepare your food on an open fire.... or stove....?
- How long does it take to cook a meal? \_\_\_\_ hours
- Do you breast feed your babies? \_\_\_\_ Yes \_\_\_\_ No
- If there is no mother's milk, what is the young baby fed?
- At what age are your babies weaned? \_\_\_\_ months
- At what age are other foods given to the baby? \_\_\_\_ months
- What foods would a breast-fed baby receive at 6 months of age? 12 months of age?
- What foods help produce more milk during nursing?
- What foods should not be eaten during lactation?
- What foods should be eaten during pregnancy?
- What foods should not be eaten during pregnancy?
- What foods, if any, are best during menstruation?
- Do you give your children any special food? Yes.... No.... If yes, what kinds?
- Are any of your children in school at any time during the year? Yes.... No.... If yes, do they receive milk at school? Yes.... No.... Any other foods?
- At what age (year) do your children begin to drink coffee.... cocoa.... chocolate.... beer.... other....

20. What foods did your family eat yesterday? (Day of week.....)

Meals	Menu items	Food items, kinds	Amounts, if known	P, H, F <sup>1</sup>	Comments
Breakfast.....	_____	_____	_____	_____	_____
Lunch.....	_____	_____	_____	_____	_____
Supper.....	_____	_____	_____	_____	_____
At other times.....	_____	_____	_____	_____	_____

<sup>1</sup> P=Purchased. H=Home-grown or gathered. F=Free gifts or supplements

	Breakfast	Dinner	Supper
Number guests present.....	_____	_____	_____
Number family members absent.....	_____	_____	_____

questionnaire method for these 28 families yielded data for the food supply of the previous 24-hour period. The food composite analysis method, of course, involved cooking losses, whereas no cooking losses have been considered in calculating the data by the other two methods.

In general, the agreement is quite good. Considering calories alone, the food composite analysis method yielded 9 percent more and the 24-hour recall method 8 percent less calories per person per day than the recipe method. The relatively very close agreement between the three methods is considered sufficient to validate completely the usefulness of the data collected by means of the 24-hour recall questionnaire procedure.

The fact that both the recipe method and the food composite analysis method yielded slightly higher caloric intakes than the 24-hour recall suggests that the food consumed in the home during the three-meal survey was slightly greater than that which might normally have been consumed. This might be expected in homes surveyed for a 1-day period only. Nevertheless, relatively good agreement in most of the data makes this rather unimportant in interpretation.

The average daily caloric intake as given in

table 5 for all 341 families was 1,967 calories per person as compared with 1,639 calories per person, or 17 percent less, for the 28 selected families as measured by the 24-hour recall method. Since the survey method is the same, the data suggest that the 28 families selected for more detailed studies were slightly below the average economic level of the total 341 family sample. This was expected since the 28 families were selected as either typical or below typical families of the general economic level of the community. In the two major cities, Quito and Guayaquil, the selected families were considered typical of a lower economic stratum of the city.

It should be pointed out, perhaps, that, even in the nine military messes in which the survey period averaged 2 days and larger food samples could be taken for the preparation of composite food samples, there was as much or more difference between the nutrient intake data based on the results of the two laboratories performing the analyses as there was between the recipe method and the food composite analysis method. This difference was primarily noted with respect to the values for fat, carbohydrate, calories, and riboflavin. This is emphasized to prevent the assumption that the data derived from the food composite analysis method necessarily are the most nearly correct (1).

**Table 4. Calculated average daily caloric intake of Ecuadorian civilians in two major areas, by age group and sex, 1959**

Age group (years)	Calculated caloric requirements (FAO) <sup>1</sup>			Calculated average per capita daily caloric intake					
				Sierra (20° C.)			Coast (30° C.)		
	Male	Both	Female	Male	Both	Female	Male	Both	Female
0-1		1, 120			1, 120			1, 126	
1-3		1, 300			1, 185			1, 097	
4-6		1, 700			1, 515			1, 435	
7-9		2, 100			1, 871			1, 773	
10-12	2, 500	2, 450	2, 400		2, 183			2, 068	
13-15	3, 100	2, 850	2, 600		2, 539			2, 406	
16-19	3, 600		2, 400	3, 226		2, 128	3, 056		2, 016
20-29	3, 200		2, 300	2, 867		2, 039	2, 717		1, 932
30-39	3, 104		2, 231	2, 781		1, 978	2, 635		1, 874
40-49	3, 008		2, 162	2, 695		1, 917	2, 554		1, 816
50-59	2, 768		1, 990	2, 480		1, 764	2, 350		1, 672
60 and over	2, 528		1, 817	2, 265		1, 611	2, 146		1, 526

<sup>1</sup> Based on FAO method of calculating energy requirements as reported in "Calorie Requirements," Rome, 1957.

<sup>2</sup> Average for males and females used, as sex data were not obtained on the 10- to 15-year-old groups.

NOTE: Adult weight: male, 60 kg; female, 50 kg.

28 families studied by means of 24-hour recall questionnaire method, recipe method, and food composite analysis method was 35 years. The corresponding age for women was 30 years. The average height for men and women studied was 62.9 and 60 inches, respectively. Males over 16 years of age averaged 133 pounds, women, 118 pounds. These are somewhat less than the weights of the reference man weighing 65 kilograms and the reference woman weighing 55 kilograms at 25 years, used by the FAO Second Committee on Calorie Requirements (2).

The energy requirements for the reference man and woman also assumed a mean annual ambient temperature of 10° C. In estimating the caloric requirements for Ecuadorians according to the method suggested by the FAO

committee, average weights of 60 kilograms for men and 50 kilograms for women were used. Mean temperatures of 20° C. for the Sierra and 30° C. for the coast were also used. Table 4 gives the calculated average per capita caloric requirement for the Sierra and coastal areas of Ecuador.

A comparison of the nutrient intake data obtained by the three different methods for the 28 families selected for multiple dietary studies with those obtained by the 24-hour recall questionnaire method for all 341 families surveyed is given in table 5. The first three columns present nutrient intake data for exactly the same families. The data for the recipe method and the food composite analysis method include the same day's food supply. The 24-hour recall

**Table 3. Participants in nutritional studies of Ecuadorian civilians, percentage of total population, by age and location, 1959**

Age group (years)	Questionnaire method <sup>1</sup>										Three-meal recipe method <sup>2</sup>	
	Coast				Sierra						Coast	Sierra
	Guaya- quil	Esme- raldas	Machala- Salinas	Aver- age	Cuenca	Tulcan	Ambato- Rio- bamba	Loja	Quito	Aver- age		
<i>Children</i>												
All ages -----	54.3	58.3	52.3	54.9	53.2	46.8	50.7	54.6	54.6	51.0	57.0	50.0
0-1 -----	3.7	3.1	4.0	3.6	3.8	4.4	4.1	5.6	3.3	4.3	.0	3.0
1-3 -----	12.2	17.2	16.1	14.0	10.6	6.5	8.7	9.1	8.0	8.3	18.0	11.0
4-6 -----	12.4	16.0	16.1	13.9	10.6	7.8	9.7	11.6	13.3	9.9	14.0	10.0
7-9 -----	11.7	6.7	5.6	9.5	11.9	8.4	7.2	10.6	10.7	9.6	11.0	8.0
10-12 -----	8.0	11.0	7.3	8.5	9.6	10.7	9.7	8.6	10.0	9.9	11.0	8.0
13-15 -----	6.3	4.3	3.2	5.3	6.7	9.0	11.3	9.1	9.3	8.9	4.0	9.0
<i>Men</i>												
All ages -----	20.6	17.2	22.6	20.2	22.1	26.7	23.1	18.2	19.3	23.0	23.0	20.0
16-19 -----	4.5	2.9	2.5	2.4	3.5	4.8	6.0	3.5	2.7	4.1	1.8	2.8
20-29 -----	7.6	11.5	7.5	6.9	6.0	5.9	6.7	3.1	4.6	5.3	9.7	8.2
30-39 -----	5.2	1.9	8.8	5.7	4.2	4.5	3.7	2.5	5.4	4.1	7.6	2.8
40-49 -----	1.4	1.0	3.8	3.4	3.3	4.8	3.7	5.6	1.4	3.9	1.8	1.0
50-59 -----	1.2	.0	.0	.8	3.3	3.2	1.8	2.0	4.1	3.0	.0	1.8
60 and over -----	.4	.0	.0	.8	1.5	3.7	1.0	1.5	1.2	2.3	1.8	3.0
<i>Women</i>												
All ages -----	25.0	24.5	24.9	24.9	24.7	26.6	26.2	27.3	26.0	26.1	20.0	30.0
16-19 -----	2.5	9.8	4.5	5.2	3.7	4.5	4.5	3.3	5.5	4.4	3.6	8.4
20-29 -----	8.5	9.8	13.7	11.0	6.9	6.7	9.4	9.6	4.7	7.0	11.0	9.3
30-39 -----	6.8	.0	6.7	5.7	5.7	4.5	3.7	8.5	4.7	5.0	1.8	4.8
40-49 -----	4.3	4.9	.0	1.5	3.7	4.5	6.3	4.1	7.3	4.7	3.6	3.9
50-59 -----	1.5	.0	.0	1.2	2.7	3.5	1.3	.0	2.6	2.6	.0	1.8
60 and over -----	1.3	.0	.0	.5	2.0	2.7	1.3	2.2	1.3	2.3	.0	1.8

<sup>1</sup> 341 families.

<sup>2</sup> 28 selected families.

ment data are not available, these tables also show the calculated nutrient allowances based on the National Research Council recommended allowances for each population and considering the percent of each age and sex category. Energy and protein requirements were calculated as described. The actual intakes as determined by the three different methods are expressed as a percentage of these calculated allowances. The agreement among the three methods is considered highly satisfactory. Not only do these

methods agree well with each other but the nutrient levels also agree quite well, when considered area by area, with those obtained in a previous dietary study reported by Thomason and associates (5).

In Guayaquil, a 7-day survey of 25 families was conducted by the National Institute of Nutrition of Ecuador in June 1959 using the recipe method. The average amount of each of approximately 50 different food items consumed daily per person during this study was ascer-

**Table 7. Average daily nutrient intake of Ecuadorian civilians in the coastal area, obtained by three methods, 1959**

Nutrient	Calculated standards based on NRC allowances (116 families)	24-hour recall questionnaire (116 families)		3-meal recipe method (13 families)		Food composite analysis method, 3 meals (13 families)	
		Amount	Percent of calculated allowance	Amount	Percent of calculated allowance	Amount	Percent of calculated allowance
Calories <sup>1</sup> .....	1, 878	1, 791	95	1, 769	94	1, 940	103
Protein (gm.) <sup>2</sup> .....	53. 3	58. 2	109	57. 2	107	63. 3	119
Calcium (gm.).....	1. 04	0. 32	31	0. 32	31	0. 6	58
Iron (mg.).....	11. 0	14. 0	127	14. 1	128	21. 0	191
Vitamin A activity (I.U.).....	4, 042	4, 554	113	3, 524	87	2, 614	65
Thiamine (mg.).....	1. 13	0. 68	60	0. 68	60	0. 39	35
Riboflavin (mg.).....	1. 57	0. 69	44	0. 65	42	0. 73	47
Niacin (mg.).....	14. 0	11. 5	82	19. 4	139	15. 1	108
Vitamin C (mg.).....	62. 0	97. 0	154	86. 0	138	47. 0	76

<sup>1</sup> Based on values shown in table 4.

<sup>2</sup> 86 percent of NRC allowances used, due to weight differences.

**Table 8. Average daily nutrient intake of Ecuadorian civilians in the Sierra area, obtained by three methods, 1959**

Nutrient	Calculated standards based on NRC allowances (213 families)	24-hour recall questionnaire (213 families)		3-meal recipe method (15 families)		Food composite analysis method, 3-meals (15 families)	
		Amount	Percent of calculated allowance	Amount	Percent of calculated allowance	Amount	Percent of calculated allowance
Calories <sup>1</sup> .....	2, 057	2, 068	101	1, 783	87	1, 935	94
Protein (gm.) <sup>2</sup> .....	55. 0	57. 8	105	59. 3	108	69. 2	126
Calcium (gm.).....	1. 04	0. 49	47	0. 47	45	0. 61	59
Iron (mg.).....	11. 0	22. 3	203	17. 1	155	32. 5	296
Vitamin A activity (I.U.).....	4, 287	4, 245	99	1, 453	34	3, 450	80
Thiamine (mg.).....	1. 18	1. 17	99	1. 0	85	0. 82	70
Riboflavin (mg.).....	1. 64	0. 81	49	0. 91	55	1. 68	102
Niacin (mg.).....	16. 0	22. 2	139	20. 8	130	20. 3	127
Vitamin C (mg.).....	71. 0	112. 0	158	77. 0	108	54. 0	76

<sup>1</sup> Based on values shown in table 4.

<sup>2</sup> 86 percent of NRC allowances used, due to weight differences.

In order to test further the reliability of the 24-hour recall questionnaire data, the calculated average daily caloric intake per person for the eight areas, together with the calculated FAO caloric requirements obtained for each of these specific populations, are shown in table 6. The caloric requirements were determined on the basis of the values shown in table 4 for the specific population samples as characterized in tables 2 and 3.

The agreement between the intakes determined by the 24-hour recall questionnaire method and the respective calculated caloric requirements was excellent for all but one location, averaging 99 percent of the requirement calculated for the entire population sample. Comparison of data obtained by the three methods also is made in tables 7 and 8 for the civilian samples in the coastal and Sierra regions of Ecuador, respectively. Since minimum require-

**Table 5. Average daily nutrient intake data for Ecuadorian civilians, obtained by three methods, 1959**

Nutrient <sup>1</sup>	Recipe method (3 meals)	Food composite analysis method (3 meals)	Questionnaire, 24-hour recall	Questionnaire, 24-hour recall
Calories.....	1, 776	1, 937	1, 639	1, 967
Protein, total (gm.).....	58. 3	66. 6	59. 1	57. 9
Protein, animal (gm.).....	23. 2	22. 7	22. 7	16. 5
Fat (gm.).....	33. 5	41. 1	29. 8	38. 1
Carbohydrate (gm.) <sup>2</sup> .....	322	315	309	376
Calcium (gm.).....	0. 40	0. 61	0. 33	0. 38
Phosphorus (gm.).....	1. 09	1. 01	1. 01	1. 09
Iron (mg.).....	15. 5	27. 2	19. 7	19. 3
Carotene (mg.).....	1. 38	1. 61	1. 92	2. 25
Vitamin A activity (I.U.).....	2, 666	3, 068	3, 500	4, 358
Thiamine (mg.).....	0. 85	0. 62	0. 81	0. 99
Riboflavin (mg.).....	0. 79	1. 25	0. 68	0. 77
Niacin (mg.).....	20. 1	17. 9	20. 7	18. 3
Vitamin C (mg.).....	79	51	64	107

<sup>1</sup> Cooking losses considered only in food composite analysis method.

<sup>2</sup> Nitrogen-free extract only.

NOTE: Columns 1, 2, and 3 present data on 28 families including 84 persons; column 4 covers 341 families including 2,079 persons.

**Table 6. Calculated average daily caloric intake of Ecuadorian civilians in eight areas, obtained by 24-hour recall questionnaire, 1959**

Location	Number of persons	Calculated caloric re- quirements (FAO) <sup>1</sup>	Caloric intake shown by 24-hour recall	Relative per- cent of calculated requirement
Coast.....	714	<sup>2</sup> 1, 878	1, 791	95
.....	427	1, 896	1, 909	101
.....	163	1, 855	1, 334	72
.....	124	1, 870	1, 990	106
.....	1, 331	<sup>2</sup> 2, 057	2, 068	101
Sierra.....	476	2, 118	2, 123	100
Tulcan-Ibarra.....	150	2, 036	1, 756	86
Quito.....	195	2, 110	2, 295	104
Ambato-Riobamba.....	312	1, 920	1, 991	104
Cuenca.....	198	1, 963	2, 102	107
Loja.....				
Total, Ecuador.....	2, 045	<sup>2</sup> 1, 995	1, 971	99

<sup>1</sup> Based on FAO method of calculating energy requirements as reported in "Caloric Requirements," Rome, 1957.

<sup>2</sup> The families selected for detailed dietary studies yielded a calculated caloric allowance of 1,905 and 2,010 for the 13 families in the coastal area and 15 families in the Sierra, respectively, with an average of 1,976 for the total 28 family samples.

## Dental Surveys in Relation to Nutrition

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In the past, most dental surveys have been concentrated upon dental caries, and no other phase of study has received more attention than the relation between this disease process and the nutrition or diet of the individual, or of the population group in which he has been found. Nonetheless, no consistent association of dental caries with a deficiency of any known nutrient has been established. The evidence from population studies has been interpreted by at least one reviewer as indicating "no correlation between nutritional status in a group of persons and the prevalence or incidence of dental caries within the group, unless group subsistence stands at, or barely above, the level of starvation." At such low levels of subsistence, caries is usually reported as minimal or absent (1).

All of the survey indices commonly employed

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are cumulative, irreversible measures of lifetime caries experience (2); there is no simple, dependable method for determining, in the field, whether caries is presently active or inactive in any individual. The difficulties in relating this lifetime of experience with present (and possibly transient) dietary or nutritional states are obvious. But if nutritional deficiency is cariogenic, it is difficult to explain why the lifetime caries experience is virtually nil among some populations despite a traditional diet grossly inadequate in one or more of the essential nutrients. In one comprehensive review Shaw (3) cites studies in which low caries prevalence was found in populations with diets or nutritive states low in vitamin D, in vitamin A, in the "vitamin B-complex," in vitamin K, in calcium, and in phosphorus.

Conversely, a high prevalence or incidence of caries is not invariably associated with diets low in quality. Collins, Jensen, and Becks (4) have shown that essential food elements were no more deficient in the diets of 122 college students who were experiencing rampant dental caries than they were in a group virtually free of caries. An inference about the nutritive status of a population, then, based solely on its experience with dental caries, is quite likely to be false.

More information may possibly be gained by a study of oral soft tissues, particularly those which, with bone and associated structures, support the teeth in the dental arch. When these

**Table 9. Average daily nutrient intake per person for 25 families in Guayaquil, Ecuador, obtained by two methods in a survey conducted by the National Institute of Nutrition of Ecuador, June 1959**

Nutrient	7-day recipe method	Food composite analysis method <sup>1</sup>	
		Laboratory A	Laboratory B
Calories-----	2,360	2,361	2,299
Protein (gm.)-----	79.2	74.4	66.5
Fat (gm.)-----	49.7	66.2	42.8
Carbohydrate (gm.)-----	398	367	412
Iron (mg.)-----	0.50	0.34	0.42
Vitamin A activity (I.U.)-----	22.0	23.2	16.2
Thiamine (mg.)-----	5,143	2,070	-----
Riboflavin (mg.)-----	1.17	0.94	0.96
Niacin (mg.)-----	0.92	1.31	0.59
Vitamin C (mg.)-----	23.2	21.7	-----
	95	37	-----

<sup>1</sup> Food items obtained in the local market and composited without further preparation. Quantity of foods based on the 7-day recipe method.

**Table 10. Intake data on certain nutrients (average per person per day) obtained by the food composite analysis method, Ecuador, 1959**

Nutrient	9 military messes	16 Sierra families	12 coast families	25 Guayaquil families
Iodine (mcg.)-----	190	230	180	100
Lysine (gm.)-----	3.1	4.1	3.2	4.3
Methionine (gm.)-----	1.4	1.2	0.8	1.1
Tryptophan (gm.)-----	0.7	0.6	0.5	0.6
Vitamin B <sub>12</sub> (mcg.)-----	2.3	1.6	1.1	2.5
Biotin (mcg.)-----	63	42	27	46
Folacin (mcg.)-----	71	77	82	119
Pyridoxine (mg.)-----	2.0	1.4	1.1	1.3
Pantothenic acid (mg.)-----	1.1	1.0	0.6	1.5

tained locally, and food composites were prepared for analysis. Table 9 shows the data obtained from the analyses of these composites at two laboratories (identified as A and B), as well as those obtained in the original recipe method study. Again the agreement is quite good. One particular advantage of the food composite analysis method is that it provides a means of obtaining intake data concerning

certain nutrients for which satisfactory tabular data are unavailable for most food items. This would include certain highly variable minerals and certain vitamins.

Table 10 includes average daily intake information obtained in the Ecuador survey concerning military and civilian dietaries with regard to the average daily intakes of iodine, lysine, methionine and tryptophan, vitamin B<sub>12</sub>, biotin, folacin, pyridoxine, and pantothenic acid. Although complete information concerning requirements is not available for some of these, it does not lessen the possibility that certain of them might be marginal.

### Summary

Three different methods of collecting dietary intake data among the civilian population of Ecuador have been compared. These are the recipe method, the food composite analysis method, and the 24-hour recall questionnaire method. In general, very good agreement was obtained between the three methods when the same 28 families were studied. The close agreement between the data obtained by these methods made reliable a larger body of data obtained from 341 families by the 24-hour recall questionnaire method alone. The results of this survey indicate that considerable information of a highly reliable nature can be obtained in a relatively short period of time with a minimum of skilled personnel.

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teeth described and photographed by Price (13), men from many of the villages showed little tendency toward the formation of periodontal pockets or loss of alveolar bone. These men were mostly residents of such isolated places as Mekoryuk, on Nunivak Island, or Shungnak, deep in the mountainous area inland from Kotzebue. There was some tendency for their excretion of thiamine and riboflavin to be higher (though plasma vitamin A levels were generally lower) than those of men in the larger settlements. In these larger villages the groups showed about the same patterns of periodontal disease as white males of Baltimore. No relation with plasma vitamin C levels could be demonstrated.

In men aged 35 years or older, alveolar recession followed the same geographic distribution as caries, with men in the isolated villages showing significantly less bone resorption than men in the principal towns.

## Ethiopia

Of the five surveyed area groups, the Ethiopians showed the lowest prevalence of dental caries.

**Dental caries in 1,085 Ethiopians, 1958**

Age group (years)	Number examined	Mean DMF teeth per person	Percent free of caries
5-9	62	0.13	90
10-14	310	.18	88
15-19	197	.21	86
20-29	209	.39	78
30-39	124	.69	66
40-49	85	1.31	57
50 and over	98	2.86	48

This study, carried out solely with civilian men, women, and children, was conducted during the fall of 1958. A total of 1,085 persons, ranging in age from 5 through 84 years, were examined. The dental sample had representation from each of the major ethnic groups and was obtained from 26 sites in 8 geographic regions of the country.

The prevalence of caries is summarized in the table.

Seventy-seven percent of the people examined were free of dental caries, and individuals under 40 years of age averaged less than one decayed, missing, or filled permanent tooth per person. No individual in the sample was completely edentulous and only seven had received restorative dental care. There was evidence of very mild dental fluorosis in the teeth of persons living in some locations of northern Ethiopia and Eritrea, but fluoride ingestion does not appear to explain the uniformly low occurrence of dental caries (14).

The diet of these people was considered to be deficient in total calories, marginal in protein, and high in carbohydrates. The consistency of the diet was soft. The use of refined carbohydrate (sugar) was limited. Mean numbers of DMF teeth appeared to be directly related to the reported frequency of sugar, jam, and honey consumption, as obtained from a questionnaire survey administered by the dietary group.

In contrast to the low prevalence of dental caries in this population, the prevalence and severity of gingival and periodontal diseases were relatively high. The usual clinical finding was one of moderate to severe gingival inflammation with widespread periodontal pocket formation after the age of about 30 years. No differences appeared to be related to ethnic origin or geographic area. Abundant deposits of soft debris and calculus were present about the teeth in virtually all mouths examined. The extent of these deposits was directly related to the condition of the periodontal tissues.

Biochemical determinations were available from about 250 individuals included in the dental sample. Evaluated by ICNND criteria (15), 36 percent of the ascorbic acid levels and 5 percent of the vitamin A levels in the serum were low or deficient. Urinary excretion values for thiamine, riboflavin, and N'-methylnicotinamide were all acceptable or high. Within these ranges and as measured by these methods, there was no relation between variations in these values and periodontal lesions.

## Peru

The study in Peru was concerned solely with the armed forces. It was conducted during the months of February, March, and April 1959.



periodontal tissues are diseased, the teeth loosen, become painful and ineffective in chewing, and eventually are lost. Local irritating factors, such as calculus and other debris, seem invariably associated with the process. In addition, clinical and laboratory research indicates that something in the physiological state of the individual modifies susceptibility to or progress of the disease (5), a hypothesis with some support in field studies (6). In the series of surveys reported here emphasis has been given to an effort to discover whether relationships exist between periodontal status in the groups studied and the physical, biochemical, or dietary findings returned by the several field teams of the Interdepartmental Committee on Nutrition for National Defense (ICNND).

Group periodontal status was scored by two methods. One, based on the clinical syndrome of marginal periodontitis, is reversible and responsive to treatment and ephemeral circumstance; it is appropriate for correlation with present nutritive states, as well as indicative of group prevalence of active disease (7). The other is a cumulative measure, a count of teeth involved in recession of investing tissues, suggested by Stahl and Morris (8). For simultaneous evaluation of local irritating factors, the presence or absence of calculus and of oral debris was noted in the Alaska survey. In Ethiopia the prevalence of calculus was universal and it was necessary to record the relative extent of the deposits. In subsequent surveys, a measure which takes into account the extent of oral debris and stain as well as the extent of calculus (9) was employed, modified to include six typical teeth.

All of these examinations were made with mirror and explorer. Patients were seated in a portable dental chair. In Alaska a standard examination lamp was used. In the other areas electricity was not ordinarily available and examinations were made by daylight.

Some striking differences in the prevalence or characteristics of periodontal disease have been seen, concomitant with differences in the nutritional status of the groups studied. Whether these are consistent relationships can be determined only by further analysis and the extension of study to new and appropriate populations.

Brief summaries of the first five ICNND surveys in which dental examiners have participated follow.

## Alaska

Dental examinations in the Alaska survey were limited to military personnel. A total of 713 members of the First and Second Scout Battalions, Alaska National Guard, were seen in March 1958. Their ages ranged from 17 to 54 years. They were residents of 55 distinct villages, ranging geographically from Point Barrow, above the Arctic Circle, to Unalaska in the Aleutian chain of islands. The group examined included about one out of each five or six Alaskan Eskimo males in the total adult population. Their general levels of nutrition and physical condition were excellent.

There were extreme variations in dental caries prevalence, associated loosely with place of residence. Men from the principal centers of population averaged 14.5 decayed, missing, and filled (DMF) permanent teeth per person. This is about the same prevalence as has been observed in white males in continental United States at the same average age (about 30 years). Men from selected groupings of villages near the principal centers averaged 13.7 DMF teeth per person. Men in more remote villages averaged 7.1 per person, except those from the Yukon-Kuskokwim delta region, where the mean per man was 2.3. Exposure to fluoride appears not to have been a factor. A decreasing prevalence of caries with increasing isolation is not uncommon in primitive peoples; a similar pattern has been observed in Eskimos of Greenland (10), and about the same prevalence of caries was reported for the Kuskokwim area in 1936 (11, 12). In the present study, men from the high-caries villages were slightly but significantly taller than men from the relatively remote low-caries areas. They were somewhat heavier, and their plasma levels of vitamin A and carotene were significantly higher. Other differences, though generally favoring the high-caries villages, were not significant.

Despite the almost universal presence of oral calculus and debris and a relatively high (38 percent) prevalence of the marked crowding of

In the central Sierra region, including the cities of Ambato, Latacunga, and Riobamba, dental caries prevalence was significantly lower than the average for the rest of the country. For persons of all ages from other areas (with a mean age of 21.5 years) the average number of decayed, missing, or filled permanent teeth was 8.6. For persons in the central Sierra region (with a mean age of 24.9 years) the average was 5.2 DMF teeth, a difference of 40 percent. In the 20- to 24-year age group the difference between the two areas is 65 percent. This lowered prevalence of dental caries probably is attributable to differences in the fluoride intake between the two groups. Analyses of water, urine, and food samples show that the people in the central Sierra were ingesting amounts of fluoride which were more than adequate for caries inhibition. In fact, the intake of fluoride was much more than the optimal amount since mottled dental enamel was quite prevalent in this area. In contrast, water samples collected from other areas of the country were consistently low in fluoride.

The area of the country (Loja) having the highest caries prevalence also had the highest consumption of sugar, according to the questionnaire survey done by the dietary group.

Females examined in Ecuador had a higher average number of decayed, missing, and filled permanent teeth than the civilian males of the same ages. The difference was greatest in those over 20 years of age.

Periodontal disease scores for all persons examined were higher than those recorded for equivalent ages in the 1954 Baltimore study. Scores for civilians in the 30- to 39-year age group averaged 1.39, while the average score for the same group in Baltimore was 0.70. There were considerable variations in the periodontal scores by location within the country. Disease was recorded as being most extensive in the northern (Tulcan-Ibarra) and southern (Loja) Sierra regions and least extensive in the eastern jungle (Sucua). This geographic distribution was similar to that seen for dental caries.

Approximately 22 percent of the 30- to 39- and 56 percent of the 60- to 69-year-old dentulous civilians examined in Ecuador showed obvious clinical signs of alveolar bone loss with

pocket formation. Of the 30- to 39-year-old males, 68 percent of the military group and 95 percent of the civilians were recorded as having positive signs of gingival inflammation.

## Vietnam

The Vietnam survey was carried out in October, November, and December of 1959. As this is being written, analysis of the data is still in the preliminary stage.

Civilians comprised about 65 percent of the sample of 3,700 persons. Dental caries prevalence was low in both civilian and military populations, only slightly higher than that reported for Ethiopians. Periodontal disease was universal in prevalence, and particularly severe and destructive in mountain tribesmen of villages in the central highlands.

Two customs of the people complicated the scoring for dental caries. One, seen in all areas, was the practice of placing gold shell crowns on sound teeth for decorative purposes or as insurance against burial expense. These were ornamented on the facial aspect with cutout designs, most frequently heart shaped, sometimes inlaid with colored plastic or celluloid. An attempt was made, through interpreters, to determine whether these crowns were restorations of carious teeth or purely cosmetic in purpose, and the latter were tabulated separately. On either tabulation, DMF means were minimal. Excluding these gold crowns, the mean number of decayed, missing, and filled permanent teeth for military males of all ages was about two per man. Inclusion of the cosmetic crowns raised the mean per man to about 2.70.

The second custom was observed only in the mountain villages. During puberty rites anterior maxillary teeth had been filed off through the pulp chamber to the level of the gum line; in one area mandibular anterior teeth had been filed to points as well. In this last district the filed stumps were generally carious or, in many instances, had been exfoliated. Elsewhere the filed stumps tended to be free of caries. For the 180 individuals 20 years of age or older in these villages there was an average of 5.3 filed teeth per person. Mean numbers of decayed, missing, and filled permanent teeth were 4.1 if cosmetic crowns and filed teeth were

During the survey, dental examinations were given to 1,500 men as part of a detailed physical examination in military installations located in seven different geographic areas. The majority (942) of these men were in the age range of 20-24 years, 458 were age 19 years and less, the remainder, age 25 years and older.

Forty-four percent of the men examined had served less than 6 months and 47 percent had from 6 to 24 months of military service. Since these men had lived most of their lives away from the military reservation, the data were tabulated by their previous place of residence as well as by place of examination. Residence areas were grouped as indicated by previous dietary studies (16-21).

The preliminary data reveal that, both by place of residence and place of examination, individuals in and from the southern Sierra had the lowest dental caries experience, averaging about one-fourth to one-fifth of what might be expected from a comparable age group in a low-fluoride area in the United States. Of the troops examined in the Puño-Cuzco area of the southern Sierra, 99.8 percent had lived in the same area prior to induction. Most of the troops examined in this area were descendants of the Inca Indians and were accustomed to strenuous activity at high altitudes. The cereal quinoa, an excellent source of natural proteins, was a typical dietary item in this area. The possibility that quinoa may have caries-inhibiting properties is currently under investigation through animal experimentation conducted at the National Institute of Dental Research, Public Health Service.

Periodontal conditions did not vary appreciably by place of residence, and approximated those reported for persons with 8 years of school or less in Birmingham, Ala. (6). By place of examination, periodontal scores ranged from a low mean of 0.7 per man at Lima to a high of 1.5 per man at Puño-Cuzco. These periodontal values bear an inverse relationship to the DMF means in these areas.

The wear or attrition of teeth was found to be highest among troops examined in the Puño-Cuzco locations, and may be related to food preparation. In villages of the southern Sierra, meal is frequently ground between a stone slab and a stone roller, thereby incorporating

fine abrasive granules into the final food product.

Navy and Air Force enlisted personnel, including a high proportion of skilled technicians of urban origin, scored more favorably on periodontal and oral hygiene status than Army enlisted personnel, a high proportion of whom are relatively unskilled persons of rural origin. Army personnel, however, had considerably lower DMF scores.

Recession of the gums was seen so rarely under the age of 25 years that it was not tabulated, and no cases of what might be considered a functional malocclusion were observed although some crowding of anterior teeth was noted occasionally.

### Ecuador

Examinations of 4,975 Ecuadorians ranging in age from 1 to 87 years were carried out during the summer of 1959. Of these, 2,947 were civilians and the remainder, military personnel. Each of the 18 Provinces was represented in this sample.

Dental caries prevalence in the whole population group did not differ greatly from prevalence levels reported for Baltimore, Md. (22). The heterogeneity of the Ecuadorian sample is indicated by the variation in dental caries means from different areas of the country. The highest prevalence was recorded for civilians in the northern (Tulcan-Ibarra) and southern (Loja) regions of the Sierra where the average number of decayed, missing, and filled permanent teeth per person was 11.56 at a mean age of 26.8 years. At the other extreme was the strikingly low prevalence of caries found in the Jivaro Indians living in the eastern jungle. The 52 Jivaros examined, averaging 26.5 years of age, had a mean of 1.25 DMF teeth. For the females the mean was 2.18 at an average age of 26.7 years, and for the males the mean was 0.57 at an average age of 26.2 years. No fluoride was found in the water samples collected in the Jivaro territory. The diet of these people is very simple, consisting primarily of yuca (cassava) and platan (cooking banana) with occasional wild game and generous helpings of chicha (a native beverage made of yuca and sweet potato, boiled and fermented).

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## Abstracting and Indexing Services

Abstracts or title listings of biological and medical articles are currently carried by 310 periodicals published in 34 countries. Of these, 154 are devoted exclusively to abstracts or title listings. The remainder are primary journals that regularly carry at least 200 abstracts per volume.

The five leading countries in terms of number of abstracts and citations published are as follows:

	Abstracting- indexing services	Abstracts and citations per annum
United States . . . . .	73	753, 160
Germany . . . . .	45	196, 300
Great Britain . . . . .	36	162, 140
Russia . . . . .	5	159, 100
France . . . . .	41	158, 900

English is the language of 120 of the abstracting-indexing services, which together publish more than 1 million abstracts and citations each year. Ger-

man, French, and Russian are each the language of between 150,000 and 200,000 items. Forty-nine journals carry items in German, 50 in French, and 5 in Russian. Four services publish some 92,000 items in Japanese.

How close these many services come to providing complete coverage of the literature is not known. Overlapping in coverage, certainly in the English language, however, must be considerable, for the total annual publication of biological and medical articles is estimated at less than 400,000.

Abstracting and indexing periodicals are described in a recent publication of the World Health Organization entitled "Current Indexing and Abstracting Periodicals in the Medical and Biological Sciences," issued as a supplement to volume 12 (1959) of *Library News*.

excluded, 4.4 with inclusion of the crowns, and 9.7 with both crowns and filed teeth included.

The higher basic DMF mean in the mountain people was apparently due to an accelerated loss of teeth from periodontal disease rather than to an increased prevalence of caries. While it was particularly severe in these people, periodontal disease was widespread in the general population as well. Heavy deposits of calculus were present in the mouth of nearly every person aged about 12 years or older. In many of the older people teeth had been coated with a black, relatively permanent lacquer. This was believed to have some protective effect. Betel chewing was a common habit.

The diet was generally soft in consistency. The staple foodstuff was rice, usually highly milled, augmented with vegetables, fish and occasional fowl, rarely with beef or pork. There were indications of deficient or marginal intakes of vitamin A, thiamine, and riboflavin in some areas. Patients with clinical beriberi were not uncommon in hospitals.

## Discussion

No consistent patterns of association between nutrition and oral status have been developed in these data, so far as they have been analyzed at this time. Lowered caries prevalence in Ecuadorian adults was related to optimal or high intakes of fluoride. Both high and low levels of caries experience were seen in Eskimos in Alaska with high intakes of animal protein, moderate intakes of fat, and very low intakes of carbohydrates, with generally low plasma levels of vitamin A. Caries prevalence levels as low or lower were seen in Ethiopians on a comparatively low-protein, high-carbohydrate cereal diet, high in thiamine; and in Vietnamese on a diet in which highly milled rice was the staple cereal, yielding only marginal amounts of thiamine and riboflavin. Large proportions of individuals in each group had remained caries free from birth to the time of examination.

If caries prevalence levels were generally low by U.S. standards, the prevalence and severity of periodontal disease were correspondingly high. The only areas where periodontal disease was importantly less prevalent than in the United States were found in Alaska, in men

whose thiamine excretion was somewhat higher, and whose levels of plasma vitamin A were somewhat lower than those for other men in that study; and in the primitive Jivaro Indians examined in Ecuador. Elsewhere in Alaska, and generally in Peru, disease levels were comparable with those seen in United States, among people of low socioeconomic status. In Ethiopia, Ecuador, and Vietnam, prevalence levels were much above any so far recorded for the continental United States.

The analysis of relations within and between these studies is continuing. Detailed reports are to be prepared as these analyses are completed.

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<i>Number of children</i>	<i>Median age of mother (years)</i>
1 -----	22
2 -----	24
3 -----	28
4 -----	31
5 -----	32
6 -----	32
More than 6 -----	35

The median number of children per family was three. Families with more than four constituted only 8 percent of this sample. The age, number of children, and breast-feeding status of the children whose mothers were interviewed follow.

<i>Age of child (months)</i>	<i>Number</i>	<i>Percent breast fed</i>
Less than 3 -----	15	82
3-5 -----	14	77
6-11 -----	26	72
12-17 -----	19	54
18-23 -----	20	40
24-35 -----	16	13
36-59 -----	23	9
Total -----	133	

Fifty-one percent of these children were boys.

Nearly three-quarters of the infants were breast fed for at least 1 year, and more than half for 18 months. That 18 percent of these infants were not breast fed to 3 months may reflect the selected sample obtained in the urban clinics.

Information was recorded concerning the

reason for discontinuing breast feeding of 36 infants. The reasons given were: 10 mothers stopped because of an ensuing pregnancy, 6 because of illness, 5 had not established successful lactation, 5 had inadequate milk, 3 interdicted nursing because of maternal tuberculosis, 2 because they were employed outside the home, 2 because the infants were ill, 1 infant was adopted at the age of 6 months, 1 mother had died, and 1 mother stopped nursing "on medical advice."

Supplements to breast feeding consisted of three types of foods: some modification of cow's milk; sugar, cereal, and tea; and foods from the family diet. By the age of 6 months 86 percent of the 133 infants were receiving cow's milk in some form. This often consisted of very small amounts (2 or 3 tablespoonfuls) of powdered milk greatly diluted and fed from a bottle. On the other hand, as much as 1 liter of fresh or evaporated cow's milk was sometimes given to a child. During the second year of life the milk supplement had decreased and, in the 3- to 5-year age group, less than two-thirds of the children were receiving milk in any form, and many of these received but a small amount. Again, the relatively frequent use of milk as a supplement in the first year of life may reflect the special nature of the group sampled at these clinics.

In the 6- to 11-month age group, 4 to 26 infants had milk fortified with cereal and 3 were



Children at Mulu Farm wait for physical examinations

# Nutrition of Infants and Preschool Children in Ethiopia

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During the nutrition survey in Ethiopia (1) several procedures were used to collect information on the nutritional status of in-

fants and preschool children. The nutrition team with the assistance of Ethiopian health officers filled out questionnaires concerning the dietary patterns of infants and children attending the outpatient clinics of three hospitals in Addis Ababa and children at the police training base in Asmara. The questionnaire also contained information on the general health of the infants and some health practices of the people.

Capillary blood samples from about two-thirds of this group and from both preschool and school-age children examined during the latter half of the survey were analyzed for serum proteins, ascorbic acid, and alkaline phosphatase after being shipped to Cairo in the frozen state. The data on growth patterns in infancy, compiled by Dr. Otto Jäger of the public health school at Gondar, are included in this report. The other growth data were collected

by the survey team wherever preschool children were examined. The clinical findings for infancy are general impressions based on our own observations and discussions with many physicians throughout the country. Tabulated clinical findings for those preschool children who were examined during the general survey are included.

## Dietary Patterns

Nutrient intake records were obtained in Addis Ababa by questionnaire by two health officers and one sanitarian. These workers interviewed the mothers of 34 children at the Mahatma Ghandi Memorial Hospital, of 41 children at St. Paul's Hospital, of 35 children at the Ethiopian-Swedish Pediatric Clinic, of 13 children at the police training base in Asmara, and of 10 children seen during the course of the survey. The selected nature of this sample is to be emphasized, but it provides information of interest.

The mother's age and number of children were recorded. Although the number of children reported usually refers to the number of living children, it is taken as roughly indicative of the mother's parity. The mothers ranged in age from 16 to 49 years at the time they were interviewed. The median maternal age was 27 years. Their median age by number of children was as follows.

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*Dr. Woodruff is with the department of pediatrics, American University Hospital, Beirut, Lebanon. Dr. Hoerman, Commander, Dental Corps, U.S. Navy, is chief of the biochemistry laboratory of Naval Medical Research Unit No. 3, Cairo, Egypt. The article is based on findings of the nutrition survey conducted in Ethiopia from September to December 1958.*

## Biochemical Findings

Capillary blood samples were collected from these children and analyzed at the Naval Medical Research Unit No. 3 in Cairo. The microchemical methods used for determination of ascorbic acid and alkaline phosphatase were those of Bessey (2). Total serum protein determinations were made by a standard biuret method. Electrophoresis was carried out on S and S 2043A paper strips and stained according to the method of Block and co-workers (3). The strips were scanned in a Beckman DU spectrophotometer at 575 millimicrons. Results are reported in absolute amounts derived by multiplying the total serum protein by the percentage of the various components. One or more determinations were completed on 100 of the 133 children. In addition, similar capillary blood samples were drawn from 39 infants or preschool children and from 19 school-age children examined during the survey and analyzed by the Navy unit.

The biochemical data obtained from the 133 children whose dietary histories were taken appeared to be similar for the four locations and are combined for presentation. They are subdivided into those children who were breast fed at the time that the sample was taken and those not breast fed. For analysis, the preschool children seen outside of Addis Ababa and the school-age children, 6 to 17 years, are considered separately.

**Table 2. Distribution frequency in percent of some biochemical findings among Ethiopian children**

Blood analysis	Addis Ababa children, 0-5 years		Other Ethiopian children	
	Breast fed	Artificially fed	Pre-school <sup>1</sup>	6-17 years
Albumin (<3.0 gm./100 ml.)	46	48	25	23
Gamma globulin (>1.2 gm./100 ml.)	0	33	79	100
Alkaline phosphatase (>10 units)	26	23	11	6
Ascorbic acid (<0.1 mg. 100 ml.)	48	57	90	77

<sup>1</sup> Feeding practices unknown.

**Table 3. Average weight of 725 infants, birth through 18 months of age**

Age (months)	Number of weighings <sup>1</sup>	Weight (grams)
0	80	3,290
1	137	3,795
2	125	4,493
3	122	5,140
4	110	5,501
5	114	6,119
6	156	6,281
7	107	6,415
8	108	6,798
9	115	6,931
10	106	7,169
11	82	6,947
12	154	7,374
13	77	7,324
14	80	7,633
15	76	7,726
16	59	8,165
17	41	8,185
18	57	8,148

<sup>1</sup> 1,906 weighings of 725 infants of both sexes.

SOURCE: Unpublished data of Otto A. Jäger, M.D., school of public health, Gondar, Ethiopia.

Results of the determinations are given in tables 1 and 2. The packed blood cell volume was below 30 percent in 4 percent of the infants seen in the clinics and in none of the infants and preschool children examined outside of Addis Ababa. Packed cell volumes were slightly lower in the breast-fed infants than in the artificially fed infants under 2 years of age. This may reflect the high iron content of the cereals eaten. Two of the school-age children had packed cell volumes of less than 36 percent.

The ascorbic acid concentration in the serum was less than 0.1 mg. per 100 ml. in 53 percent of the children on whom dietary histories were obtained. There were no meaningful differences between breast-fed and artificially fed children. Only 6 of 113 infants had ascorbic acid concentrations greater than 0.7 mg. per 100 ml. Among the preschool children examined elsewhere and among school children, 90 and 77 percent respectively had less than 0.1 mg. per 100 ml. of ascorbic acid in their serum.

The serum alkaline phosphatase activity was elevated above a high normal level of 10 nitrophenol units per liter in 23 and 26 percent of the artificially fed and breast-fed infants respectively. Among the preschool children ex-



receiving bread, injera (a sourdough pancake made from teff, a local grain similar to wheat), or potato. Two infants in this age group received eggs "frequently." During the second year of life 23 of 39 infants were being fed injera, wat (a hot, highly seasoned stew or thick soup, commonly containing ground red pepper, garlic, onions, butter or oil, potatoes, pulses, and occasionally meat), and bread, and only a very few children received any fruit or eggs. About one-fifth of the infants received nothing but milk even after the age of 2 years, half of these being fed it in the fresh form. The others received only those foods provided by the family diet.

Only one-third of the infants under 1 year of age received boiled water. This is more than one would expect throughout the country as a whole. Only 12 of the 133 infants received vitamins at any time, and of these the majority received vitamin A and D capsules for a limited period. An attempt was made to collect estimates of exposure to sunlight, but this proved unsuccessful. Seventeen percent of the children over 1 year had been given beer.

One-third of those over 12 months of age were reported to eat dirt. This habit disappeared shortly after the age of 2.

Fifteen percent of the children over 1 year had been known to have passed *Ascaris*. Approximately 43 percent of the infants had had at least one attack of diarrhea, and several had experienced repeated episodes.



Diet inquiry at Tessemet during the nutrition survey in Ethiopia

Thirty-three percent of the children over 6 months of age had had the roots of the lower cuspid teeth needled and 39 percent had had the uvula amputated. These practices were even more common in rural areas and are part of traditional folk medicine.

Of the complaints for which children were brought to the clinic, one-quarter were recorded as gastrointestinal and respiratory disturbances. The next most common reasons for consulting a physician were to obtain vaccination or because of malnutrition.

Table 1. Median capillary blood values, Ethiopian infants and children

Blood analysis	Addis Ababa children, 0-5 years		Other Ethiopian children		Total	Range of 10-90 percentile	Number of samples	Range of number of samples per group
	Breast fed	Artificially fed	Pre-school <sup>1</sup>	6-17 years				
Packed cell volume.....	38.1	40.8	40.5	43.0	40.0	32-46	150	18-63
Ascorbic acid (mg./100 ml.).....	.12	.09	.06	.07	.08	0.00-0.65	113	13-44
Alkaline phosphatase (nitrophenol units).....	6.6	6.3	6.7	5.8	6.5	4-11	101	17-35
Total serum proteins (gm./100 ml.).....	6.75	6.70	7.60	7.4	7.1	5.8-8.7	78	12-30
Albumin (gm./100 ml.).....	3.1	3.1	3.3	3.5	3.2	2.4-3.8	74	11-28
Alpha-1 globulin (gm./100 ml.).....	.45	.45	.52	.54	.49	0.33-0.69	74	11-28
Alpha-2 globulin (gm./100 ml.).....	1.20	1.19	1.22	.96	1.16	0.66-1.57	74	11-28
Beta globulin (gm./100 ml.).....	.96	.95	1.17	1.05	1.04	0.75-1.60	74	11-28
Gamma globulin (gm./100 ml.).....	.90	.85	1.45	1.87	1.30	0.65-2.05	74	11-26

<sup>1</sup> Food practices unknown.

resulted in a rather widely agreed-upon estimate that the incidence of rickets is about 30 percent at the age of 1 year. Rickets appears to be mild in its clinical manifestations in almost all the areas visited, since permanent rachitic deformities were rare. Rickets disappear after the age of 2 to 3 years. Usually, young infants do not receive either vitamin D supplementation or adequate exposure to sunlight until after they learn to walk and to fare for themselves. The available data on the serum alkaline phosphatase levels are compatible with this hypothesis.

Protein malnutrition was seen frequently in all the pediatric clinics visited, although the manifestations of red hair and severe dermatosis were rare. There appeared to be a higher incidence of protein malnutrition among the hospital population in Asmara than in Addis Ababa. In Asmara the survey team observed four instances of protein malnutrition in the pediatric ward on one visit and eight on another. The frequency with which children with protein malnutrition are brought for specific medical attention probably does not represent the true incidence of the condition, particularly since low serum albumin levels were found in half of the infants tested and growth retardation in the preschool group was very

common. Abnormally low serum albumin concentrations were found among the school children also.

Inquiries concerning other deficiency diseases in childhood were made. Occasional cases of scurvy were reported in Addis Ababa. None was seen during this survey. No clear instance of avitaminoses of the B-complex had been recognized, and anemia is relatively uncommon except as associated with malaria or hookworm infestations in some of the lowland areas. Neither of these diseases was found with any great frequency among the populations from which the preschool children were drawn.

The incidence of diarrhea in the infant population was difficult to assess except that it made up 40 to 50 percent of the hospital admissions in the preschool age group and accounted for a high percentage of the clinic visits. The association of recurrent bouts of diarrhea with protein malnutrition has been noted wherever protein malnutrition exists, and it is suggested that a similar association occurs in Ethiopia.

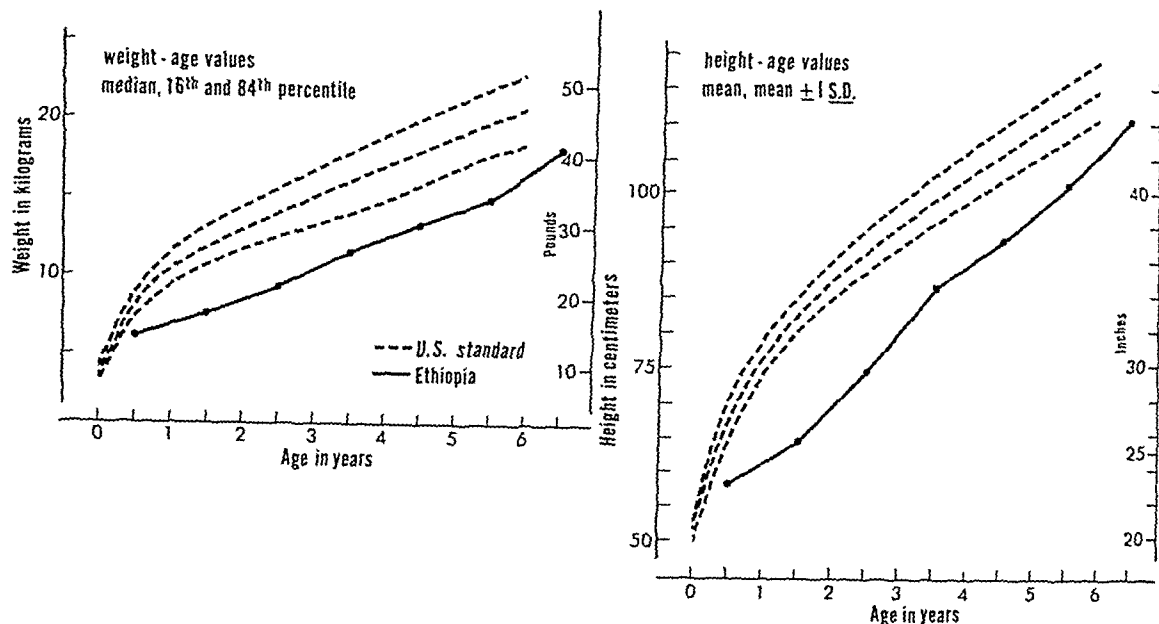
In the course of the survey 432 children less than 5 years of age were given an abbreviated clinical examination, and on 53 of these detailed physical examinations were done. The findings have been presented in table 4. By comparison with the total population group (1,5) there

**Table 4. Comparison of clinical findings in examinations of infants and preschool children with findings in total survey sample over 15 years, by percent**

Clinical findings	0-4 years		5-14 years		Over 15 years	
	Male N=221	Female N=211	Male N=1,371	Female N=697	Male N=2,497	Female N=813
Glands: Thyroid enlarged.....	0.5	0.0	2.5	5.1	2.4	12.2
Skin, face, and neck: Nasolabial seborrhea.....	.0	.0	.1	.1	22.5	9.8
Eyes: Bitot's spots.....	.0	.0	2.6	.1	1.5	.6
Lips:						
Angular lesions.....	1.4	3.3	1.2	.1	.5	.5
Angular scars.....	2.3	1.4	5.1	6.1	6.6	8.4
Cheilosis.....	2.7	4.3	4.9	5.2	4.0	3.9
Tongue: Filiform papillary atrophy, moderate or severe.....	.9	.5	4.1	.1	1.3	2.5
Gums:						
Marginal redness or swelling <sup>1</sup> .....	11.5	14.8	52.6	36.7	50.5	45.8
"Scorbutic-type" gums.....	.5	.9	1.3	.1	1.0	.7
Skin, general: Follicular hyperkeratosis.....	1.8	2.8	11.6	5.2	4.4	2.5
Lower extremities:						
Bilateral edema.....	1.8	.5	.1	2.2	1.4	5.7
Loss of ankle jerk.....	.9	1.4	2.2	1.4	3.9	3.9
Calf tenderness, moderate or severe.....	.0	.0	.1	.1	.3	.6

<sup>1</sup> These data obtained from detailed examinations.

# Average height and weight of Ethiopian boys 0 to 6 years of age compared with U.S. standards



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aminated as part of the regular survey, only 11 percent had elevated values and only one of the school children had a high value. Two of the preschool children had values above 30 nitrophenol units per liter, indicative of highly abnormal activity.

The total serum protein was determined on 78 infants and children. No differences were found between those breast fed and artificially fed. The serum albumin as determined electrophoretically was less than 3.0 gm. per 100 ml., a definitely subnormal value, in approximately one-half of the infants and one-quarter of the preschool and school children.

The alpha-1 globulin levels were within limits accepted as normal according to current American standards (4), while the alpha-2 and beta globulin values were elevated. In the breast-fed infants the median gamma globulin was 0.9 gm. per 100 ml. with little variability. Among the artificially-fed infants the median value was almost the same, but there were more values above 1.2 gm. per 100 ml. The median gamma globulin value for the preschool infants outside of Addis Ababa was 1.4 grams percent. For the school children the median value was 1.8 grams percent, with all of the values falling above 1.2 grams percent. The variation in the total serum protein among these groups was in

large part due to the variation in gamma globulin levels.

## Growth Patterns

The growth of Ethiopian infants has been documented by Dr. Otto Jäger of the public health school at Gondar. He tabulated weights of infants between birth and 18 months of age (table 3). These infants appear to have relatively satisfactory growth rates until the age of 5 or 6 months, at which time the gain in weight becomes very slow.

Data obtained during the nutrition survey extended these observations and demonstrated that growth failure persisted throughout the growth period (see chart). The chart shows the height and weight of Ethiopian boys compared with children in the United States. The Iowa growth curves were used as an arbitrary standard since suitable growth curves for Ethiopia were not available. Ethiopian children cared for by Swedish parents grew in keeping with European growth standards (personal communication, Dr. Edgar Maanheimer of the Ethiopian-Swedish Pediatric Clinic).

## Clinical Findings

Discussion with physicians interested in children in Addis Ababa and elsewhere in Ethiopia

resulted in a rather widely agreed-upon estimate that the incidence of rickets is about 30 percent at the age of 1 year. Rickets appears to be mild in its clinical manifestations in almost all the areas visited, since permanent rachitic deformities were rare. Rickets disappear after the age of 2 to 3 years. Usually, young infants do not receive either vitamin D supplementation or adequate exposure to sunlight until after they learn to walk and to fare for themselves. The available data on the serum alkaline phosphatase levels are compatible with this hypothesis.

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were several differences which may be attributable to age.

There was a low incidence of thyroid enlargement among these children, only one instance being recorded. Nasolabial seborrhea was not noted in this age group. Bitot's spots were not seen. The relatively high incidence of conjunctival injection was due to conjunctivitis. The incidence of follicular hyperkeratosis was lower in this age group than in older children, particularly for the boys.

Lesions at the angles of the lips were more common in this age group than in any other, with an incidence of 3.3 percent in the girls. Edema was not as frequent a finding in these young children as had been expected on the basis of the serum albumin levels.

The other clinical observations have an incidence pattern that does not appear to differ significantly from the rest of the Ethiopian population observed. No scurvy, beriberi, pellagra, or xerophthalmia was observed.

### Summary and Conclusions

The dietary histories are representative of infants living in cities who attended clinics, and cannot be considered representative for the country as a whole. The food practices reflect a degree of sophistication beyond that to be expected generally. The feeding pattern consisted of breast feeding for periods of 18 months or longer for almost half the infants. Supplements of cow's milk were given to more than 80 percent of the children at some time during the first year of life and somewhat less frequently thereafter. Supplementary foods used were mainly injera, bread, and tea. By the age of 2 years the child usually ate the adult diet, but in some instances still received only milk.

The laboratory assessment of the nutritive status of this group of preschool and school children warrants several conclusions. Anemia was relatively uncommon. The intake of ascorbic acid resulted in high blood levels of vitamin C in only 5 percent of the group and deficient levels in 65 percent. The alkaline phosphatase activity was elevated in 11 to 26 percent of the preschool children but in only one school child. The serum proteins showed greater variability than would be expected in healthy individuals, with an excess of both low

and high values. The serum albumin level was abnormally low in one-half of the infants and one-quarter of the preschool and school children. The alpha-2 and beta globulin values were almost universally elevated, and the gamma globulin was elevated in all but the breast-fed infants examined in Addis Ababa. It is suggested that the increase in gamma globulin levels may result from the increased number of contacts with infectious or parasitic disease, which seems more likely to occur in artificially fed infants. From the laboratory assessment it appears that there are widespread low intakes of ascorbic acid, that the clinical evidence of common mild rickets is supported, and that the hypoalbuminemia and hyperglobulinemia may reflect environmental influences, including nutrition. There is little nutritional anemia among these infants and preschool children.

The growth observations are similar to those reported from other areas of the world where protein malnutrition is common, where pre-clinical kwashiorkor exists, and infant- and child-feeding practices are similarly unsatisfactory.

The most common nutritional diseases seen in infancy were rickets and protein malnutrition. The association of edema, marasmus, and diarrhea was encountered frequently. Growth failure was almost universal in the preschool children, although incidence of specific nutritional disease in this age group was low in those brought for examination.

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# Endemic Goiter in Latin America

NEVIN S. SCRIMSHAW, Ph.D., M.D., M.P.H.



Interest in the problem of endemic goiter in Latin America has been greatly stimulated by the series of FAO-WHO conferences on the nutritional problems of Latin America, held successively in Montevideo in 1948 (1), Rio de Janeiro in 1950 (2), Caracas in 1953 (3), and Guatemala City in 1957 (4). Each of these recommended that surveys for the detection of endemic goiter be carried out in all of the countries of Latin America, and made it apparent that endemic goiter was a serious public health problem in the great majority of them. As a result, a large number of surveys have been published, and the information on the distribution of endemic goiter in the hemisphere has become increasingly complete.

The report of the third Latin American nutrition conference (3) deserves special attention since a third of it was devoted to a complete analysis of the problem of endemic goiter in the Americas, including not only prevalence, contributory factors, and public health significance, but also practical details of prevention and treatment. The demonstration by Góngora and Mejía Caicedo (5) of the effectiveness of iodization of salt in the State of Caldas, Colombia, and the work of the Institute of Nutrition of Central America and Panama on the practical value of potassium iodate for the iodiza-

tion of crude, moist salt (6, 7) have widespread significance. Attention should also be given to the metabolic investigations of Stanbury (8), carried out mainly in the Province of Mendoza in Argentina. More recently, epidemiological studies carried out in Brazil (9, 10) and Ecuador (unpublished data of the National Institute of Nutrition) have shed further light on environmental factors in the occurrence of endemic goiter.

Extensive reviews of the occurrence of endemic goiter in Latin America were published in 1950 (11) and 1954 (12). A Bulletin of the World Health Organization, published in 1958 and devoted entirely to the problem of endemic goiter (13), contained a systematic survey by Kelly and Snedden of the world prevalence and geographic distribution of endemic goiter, including Latin America.

## Distribution in Latin America

*Argentina.* Endemic goiter is prevalent in the Provinces of San Juan, La Rioja (14, 15), Catamarca, Jujuy (14-16), Córdoba, Corrientes (17), Neuquén (14, 15, 17), and Misiones (15-17). In Formosa, examination of 3,800 students showed a prevalence of 69 percent, and 38,000 students in Mendoza had a frequency of 19 percent (18). Other studies (14-16, 18, 19) have reported prevalence figures as low as 12 percent and as high as 73 percent, according to the locality. In the Province of Salta, 87 percent of the boys and 88 percent of the girls examined in a group of 1,300 students had goiters

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*Dr. Scrimshaw is regional adviser in nutrition, Pan American Health Organization, and director of the Institute of Nutrition of Central America and Panama, Guatemala City.*

were several differences which may be attributable to age.

There was a low incidence of thyroid enlargement among these children, only one instance being recorded. Nasolabial seborrhea was not noted in this age group. Bitot's spots were not seen. The relatively high incidence of conjunctival injection was due to conjunctivitis. The incidence of follicular hyperkeratosis was lower in this age group than in older children, particularly for the boys.

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percent, and 58 percent in school children. Of the goiters recorded, 28 percent were grade 2 and nearly 14 percent were grade 3, according to the WHO classification (46). In Ecuador, cases of cretinism have been observed since 1824 (47).

*El Salvador.* Studies among nearly 24,000 school children in urban areas and 9,000 in rural areas, which included 14 Departments of the country, showed an average prevalence of endemic goiter of 30 percent and 29 percent respectively (48,49). One Department (Ahuechapán) had a frequency of 26 percent in the capital city and 54 percent in rural areas. The 8,000 children examined in the National Capital had only 1 percent endemic goiter, reducing the general average. No cases of cretinism, deaf-mutism, or idiocy were reported.

*Guatemala.* Of the total of 39,484 persons examined in all 22 Departments, representing 1.4 percent of the population (50), 28 percent were adults, 70 percent were school children, and 2 percent preschool children. The overall goiter prevalence of 38.5 percent was the highest in Central America. The averages in each Department were: Baja Verapaz 64 percent, Chimaltenango 59 percent, Sacatepéquez 56 percent, San Marcos 54 percent, Totonicapán 45 percent, Quiché 44 percent, Alta Verapaz 42 percent, Santa Rosa 39 percent, Retalhuleu 38 percent, Suchitepéquez 37 percent, Sololá 37 percent, Huehuetenango 37 percent, Jutiapa 36 percent, Escuintla 34 percent, Chiquimula 33 percent, Quezaltenango 30 percent, Progreso 30 percent, Guatemala 28 percent, Zacapa 22 percent, Jalapa 22 percent, Izabal 20 percent, and Petén 7 percent. The prevalence of endemic goiter tended to increase with altitude.

*Honduras.* A survey by Borjas (51) on 12,644 persons in 15 Departments showed an overall prevalence of 22 percent with the following age distribution: children, ages 6 to 12, showed a frequency of nearly 16 percent in boys and 23 percent in girls, while in the adolescent group, 13 to 18 years, the frequency was 19 percent in boys and 30 percent in girls. In adults, 19 years and over, there was a frequency of 52 percent in males and 41 percent in females. Departments with the highest prevalence rates were: Lempira 46 percent, Santa Bárbara 43 percent, Francisco Morazán 41 percent, Valle

36 percent, Choluteca 23 percent, La Paz 18 percent, Ocotepeque 17 percent, Copán 15 percent, and El Paraíso 13 percent.

*Mexico.* Stacpoole (52) reported that in more than 1 million persons in the eight central States there was an overall prevalence of 19 percent. On the basis of reports of public health physicians, he believed that, except for Lower California, the whole country was affected, although the frequency was less in the north central and coastal States. He estimated that at least 3 million persons in Mexico had endemic goiter.

*Nicaragua.* Arce Paiz and Pérez (53,54) reported a prevalence of 26.5 percent among 15,500 persons in a survey covering the whole country. The prevalence was over 30 percent in the Departments of Chinandega, Estelí, Madriz, Matagalpa, Nueva Segovia, and Rivas; 20-30 percent in the Departments of Carazo and Managua; and 10-20 percent in the remaining five Departments of Boaco, Chontales, Jinotega, León, and Masaya.

*Panamá.* W. Ascoli and his associates have reported in unpublished data that in 1958 a national survey of 7,578 school children showed an overall prevalence of 31.5 percent. The frequency, by Provinces, was: Coclé 26.4 percent, Colón 17.4 percent, Chiriquí 61.5 percent, Bocas del Toro 5.2 percent, Veraguas 67.5 percent, Herrera 26.9 percent, Los Santos 62.8 percent, Panamá 15.8 percent, and Darién 8.3 percent. These figures are similar to those reported previously by Reverte in his surveys in the Provinces of Herrera, Veraguas, Coclé, Panamá, and Colón (55-59).

*Paraguay.* Of 13,000 school children between the ages of 6 and 16 years examined in 35 towns of this country, 30 percent had endemic goiter (60). Extensive examinations carried out by national health service physicians indicated a relatively high frequency of goiter and a considerable number of children with suggestive signs of cretinism (61).

*Perú.* In 1938 Burga Hurtado (62) reported a goiter prevalence of 90 percent in the lower zones and 30 percent in the higher altitudes in the Department of the Amazon. Salazar published an extensive monograph in 1952 (63) on personal investigations for the northern, central, and southern areas of the country, in-



(20). Tucumán (1) had an average prevalence of 75 percent; 65 percent in the boys and 61 percent in the girls among the 1,800 students examined (18). It was also stated that 0.44 percent of this group were mentally retarded. Many of the authors cited cases of feeble-mindedness, cretinism, and deaf-mutism as well.

*Bolivia.* The most recent and complete study (21), published in 1946, gave a prevalence of 40 percent or more in the Provinces of Zudáñez, Oropeza, Azurduy, Boeto, Vallegrande, Chiquitos, and Cordillera y Tacuaremboti. In Azurduy, cases of goiter occurred among the newborn. The Tacuaremboti inhabitants were known as "los cotudos de Tacuaremboti." La Paz, Cochabamba, Potosí, and Santa Cruz described endemic goiter as frequent, and it was also observed in Oruro. In Tarija, the following frequencies were observed among the students of four localities: Ríos 60 percent, San Lorenzo 50 percent, Padcaya 30 percent, and Concepción 33 percent (22). Duguid (23) states that near the Rio Grande "all the women suffer from goiter," and Fernández (24) mentions that in the village of Cotoca, near the city of Santa Cruz, all stages of cretinism were found.

*Brazil.* In Matto Grosso (25, 26), as well as in Minas Gerais (27, 28), Paraná (29), Sao Paulo (30-35), and Rio de Janeiro (36), very high prevalence figures for endemic goiter have been reported. According to Lobo Leite (37), the frequency for all the State of Minas Gerais is 44 percent. Lobo Leite also encountered cretins, deaf-mutes, and the mentally deficient. A recent survey by Barca Pellon and others (37) of 866,217 school children between the ages of 5 and 17, included 20 States, 4 Territories, and the Federal District. The survey gave the following prevalence figures: north 9.4 percent, western northeast 6.0 percent, eastern northeast 0.6 percent, northeast 0.9 percent, southeast 27.0 percent, mideast 53.8 percent, and south 27.7 percent. In some of the communities surveyed the prevalence was over 80 percent.

*Chile.* It is probable that goiter is highly endemic in the regions situated at the foot of the mountains, along the rivers Aconcagua, Maipó, Cachapoal, and Teno (38). The disease is not restricted to the valleys of the Andes since a third of the persons examined in the

village of California had goiter, and a relatively high prevalence occurred also among the residents of Doñihue, Cerrillos, and other neighboring localities (39). Goiter occurred also in Teno, near Curicó (40), in Chimbarongo (38), and in La Punta, Province of O'Higgins (41). A survey by Donoso and others (42) of school children in the Province of Santiago, gave a prevalence of 11 percent in 39,433 examined, with variation from 0 to 37 percent. These authors believed that the prevalence of endemic goiter was increasing in Chile.

*Colombia.* In Colombia, the problem of endemic goiter has been recognized for many years and studied intensively. Citing only the more recent studies, Caycedo in 1946 reported goiter in 89 percent of 5,000 students in the Department of Cauca, 81 percent of 25,000 in Caldas, 67 percent of 5,000 in Boyacá, 75 percent of 200 in Santander del Sur, and 71 percent of 12,500 in Valle (43). From 1945 to 1948, almost 185,000 students from all over the country were examined and a prevalence of 53 percent was encountered (44). A subsequent report (8) classified the Departments of the Atlantic Coast, Atlántico (23 percent), Magdalena (24 percent), and Bolívar (29 percent), as zones of "low" prevalence; the Departments of Nariño (38 percent), Santander del Sur (47 percent), Valle (53 percent), and Boyacá (58 percent) as zones of "medium" prevalence; and the Departments of Huila (69 percent), Cauca (80 percent), and Caldas (81 percent) as having "high" prevalence.

*Costa Rica.* In 1956, Pérez and others (45) reported the results of examinations among 26,768 school children in all 7 Provinces of Costa Rica as follows: Guanacaste 26 percent, Puntarenas 20 percent, Alajuela 20 percent, Heredia 15 percent, San José 12 percent, Cartago 12 percent, and Limón 10 percent. In addition they found a higher prevalence of goiter in females than in males, and in rural areas than in urban areas.

*Ecuador.* An overall goiter prevalence of 50.5 percent was reported in the surveys conducted by the National Institute of Nutrition (unpublished data) among nearly 5,000 individuals from Quito and 10 rural communities in the Province of Pichincha. The prevalence in women was shown as 56 percent, in men 45

and Canada, and not less than the 1 part in 20,000 used successfully in Colombia. Until clear-cut evidence is available that lower levels are equally effective and that goitrogenic factors are not important in Latin America, this seems a reasonable recommendation in view of its low cost and complete safety.

Lowenstein (10) has reported the results of a longitudinal nutrition study among 75 families representing 347 persons living in the Brazilian Amazon community of Belterra whose extremely low cash income was increased threefold from 1955 to 1956 with a corresponding marked improvement in dietary intake of essential nutrients. Coincident with this change the size of the goiters decreased although there was no significant change in overall prevalence. The author believes the changes to have been due to the general nutritional improvement rather than increased dietary iodine content alone, but no analyses of dietary iodine were made. An unpublished study by the National Institute of Nutrition of Ecuador reported that half of 200 individuals in 5 villages had 24-hour urinary iodine excretions below normal limits. Since some individuals with goiter had values which were apparently normal, the authors suspect that goitrogenic factors may be contributing to endemic goiter in this area. Individuals with goiter were found consistently to have abnormally rapid uptakes of labeled iodine ( $I^{131}$ ).

#### Progress of Salt Iodization in Latin America

In Paraguay, effective and complete iodization of salt with potassium iodate is required by law and is carried out under the direct supervision of the nutrition section of the health department. In Guatemala, compulsory iodization of salt with potassium iodate was begun in 1958 and is now reasonably complete. At the time of the fourth Latin American nutrition conference in 1957, legislation requiring the iodization of all salt had also been passed by Colombia, Costa Rica, Ecuador, and Panama, but was not yet enforced. In addition, Argentina, Brazil, and Uruguay had legislation requiring the iodization of salt for those regions in which goiter was a public health problem. This has been defined as a prevalence greater

than 10 percent. Nearly all the other countries have legislation pending to require salt iodization, but delays have been due not only to inertia, but also to the very real difficulty of arranging for iodization of the output of a large number of very small producers. Continued slow but steady progress toward salt iodization throughout Latin America can be anticipated.

#### Conclusions

Endemic goiter occurs as a serious health problem in the countries of Bolivia, Colombia, Ecuador, El Salvador, Guatemala, Honduras, Mexico, Nicaragua, Panamá, Paraguay, Perú, and Venezuela, and in extensive areas of Argentina, Brazil, Chile, and Uruguay. Since it is known to occur also in the United States and Canada, it is thus a problem of concern to all of the Americas. Cretinism, deaf-mutism, and feeble-mindedness are frequently reported in association with a high prevalence of endemic goiter, but there is still no direct evidence for causal relationship.

The importance of salt iodization as a preventive measure is widely recognized, and legislation requiring it is already in effect in 9 of the 20 Latin American countries, although it has not yet been put into practice in all of them. The level of iodization recommended for Latin America by successive nutrition conferences is not less than 1 part of iodine in 20,000 and not more than 1 part in 10,000 parts of salt. The former proved effective in Colombia and the latter is used in the United States and Canada; both are higher than used in Europe. While environmental goitrogenic factors are presumed to increase requirements for iodine in Latin America, there is only speculation as to their possible nature or relative importance. In general, potassium iodate is preferred because it is stable when added to crude moist salt and it requires no special refining or packaging.

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cluding parts of the coast, mountains, and jungles. He found an overall goiter prevalence of 36 percent in men and 64 percent in women, as well as cretins, idiots, and some deaf-mutes. Burga Hurtado (64,65) has reported that in some areas of the Province of Rodríguez de Mendoza the prevalence reached 100 percent, while in the Department of Ancash it was less than 10 percent. The highest prevalence was found at altitudes between 1,000 and 3,000 meters.

*Uruguay.* In spite of previous reports that endemic goiter does not exist in Uruguay, a survey by Bauza and others (66) among school children in five of the eastern Departments of the country showed that endemic goiter prevalence varied between 6 and 17 percent.

*Venezuela.* In 1941 (67) a questionnaire concerning goiter was filled out by the authorities in a number of towns. Eight of the replies indicated a prevalence of endemic goiter greater than 10 percent. La Grita with 47 percent, Guarico with 28 percent, and Monte Carmelo with 25 percent, had the highest frequencies among the localities that responded. In La Grita, cretinism was reported in 2 percent of the school children, and four other towns also reported cases of both cretinism and deaf-mutism. In a study of endemic goiter which included uptake of labeled iodine ( $I^{131}$ ), Roche and others (68) reported that the community of Bailadores, situated in the western mountains of the country, showed a prevalence of 81 percent in adult men, 89 percent in adult women, 77 percent in boys, and 85 percent in girls.

*Caribbean Islands.* The clinical nutrition surveys that have been carried out in Jamaica, Cuba, Haiti, Puerto Rico, and other islands of the Caribbean do not list endemic goiter as a public health problem.

### Effectiveness of Salt Iodization

One of the best demonstrations of the effectiveness of the iodization of common salt for the prevention of endemic goiter carried out anywhere in the world has been reported by Gónzora and Mejía Caicedo (5). In the Province of Caldas, Colombia, the distribution of salt iodized with potassium iodate at a level of 1 part of iodine in 20,000 parts of salt resulted in

a decrease in the prevalence of goiter from 83.1 percent among 8,000 school children in 1945 to 33 percent among 6,500 in 1952. Confirmation of the effectiveness of iodine supplied at the level obtained by salt iodization in the prevention of goiter under conditions prevailing in Latin America comes from the studies in El Salvador and Guatemala (6). Five milligrams of iodine given once a week in tablet form, either as potassium iodide or potassium iodate, resulted in a very marked reduction in the prevalence of goiter among school children in periods as short as 15 weeks. No change was observed in groups given placebos. Goiter returned during the school vacation when iodine administration could not be continued.

The significance of this study was in the demonstration that potassium iodate is sufficiently stable to be added to crude, moist salt without the necessity for either refining or special packaging (6). Stacpoole has also reported good results with salt sprayed with potassium iodate and administered to 200 school children in San Andrés, Totopostec, Mexico (52). On the basis of these studies, the third conference (3) recommended "that when a dry refined salt containing suitable stabilizers and protected from moisture cannot be conveniently and economically distributed, potassium iodate should be employed for iodization," and most technically underdeveloped areas are now using or plan to use potassium iodate rather than potassium iodide for the iodization of salt. It is hoped that in the next few years reports of repeat surveys will be published after national iodization programs have been introduced.

There is no definite information available on the operation of goitrogenic factors in Latin America. Thus far, iodine administration has been effective in reducing goiter prevalence wherever it has been tried, but the levels employed have been 5 to 10 times higher than in Europe. The natural levels of iodine in some freshly produced salt samples in areas of Latin America where goiter is highly prevalent approach the level of 1 part in 100,000 recommended by the WHO study group which met in London in 1952 (46). The third conference took the position that salt iodization for Latin America should be at a level of not more than the 1 part in 10,000 used in the United States

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are most often found in school-age children, with boys being more frequently affected than girls.

Bitot's spots rarely occur in well-fed populations but, instead, are customarily observed in areas where diet is restricted. They are not peculiar to the pigmented races. The possible etiological influences of race, hygiene, and climate are not easily appraised. Poor nutrition is a factor to be considered, but there is no single striking deficiency which consistently has been demonstrated to be a requisite for the appearance of Bitot's spots.

What is the evidence that Bitot's spots may be related to a lack of dietary vitamin A? Historically, the first suggestion comes from Bitot's description of these lesions in children with night blindness (2). Experimental studies since his time have specifically linked vitamin A deficiency to reversible night blindness. Impairment of night vision has not, however, been consistently related to Bitot's spots. Disappearance of the conjunctival spots with nutritional improvement and sometimes with vitamin A therapy alone has been reported (3-7). There is a single report of Bitot's spots occurring in experimental animals whose major deficiency was intended to be vitamin A (8).

On the other hand, experiments in human vitamin A deprivation have failed to produce these lesions (9), and there are several studies in which vitamin A administration or foods containing vitamin A failed to abolish Bitot's spots (10-15). In this group of publications night blindness was not presented as a characteristic accompaniment of the Bitot's spots, whereas most reports of favorable response to vitamin A have noted impaired night vision as a pretreatment condition.

Recently a mass survey of inhabitants of Ruanda-Urundi was performed for the appraisal of vitamin A deficiency as evidenced by Bitot's spots (16). Night vision was not tested. Although there was no correlation of blood levels of vitamin A with the presence or absence of Bitot's spots in individuals, there was a slightly lower average blood level of the vitamin for the total number of persons affected with the spots. Indeed, the observed levels of serum vitamin A were above those usually regarded as associated with clinically rec-

ognized deficiency states. Rather than proving a specific Bitot's spots-vitamin A correlation, the results might better be interpreted as indicative of a lower nutritional status in the group with conjunctival spots.

Histologically, Bitot's spots consist of masses of corynebacteria, keratinized epithelial cells, fatty debris, and edema of the mucosa and submucosa. None of these characteristics is pathologically specific for vitamin A deficiency. Bitot's spots contain no unique tissue characteristics. They are localized areas of xerosis whose appearance probably depends upon accumulation of bacteria on a site of bulbar conjunctiva which is relatively protected from lid massage.

Two terms traditionally associated with hypovitaminosis A are xerosis and keratomalacia. Full discussion of these terms extends beyond the scope of this paper, but their importance in regard to the significance of Bitot's spots warrants some mention.



Typical Bitot's spot, a conjunctival lesion located temporally near the corneal limbus

There is no satisfactory agreement as to how xerosis should be defined. Pathologically, it is a keratinizing metaplasia of the epithelium (17). Clinically, this gives the conjunctiva a dry, wrinkled, cadaverous appearance. The eyes of healthy persons who are subjected to prolonged outdoor exposure, such as sailors or farmers, may also attain the dry-eyed appearance with fine wrinkling of the bulbar conjunctiva. Such xerosis, or perhaps pseudoxerosis, does not attain the same severity, but it is also a



# Bitot's Spots and Vitamin A Deficiency

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Nearly 100 years have elapsed since the French physician, Bitot, described the conjunctival spots which now bear his name. There

has since developed a popular concept that these eye lesions are a specific mark of vitamin A deficiency, and despite previously published evidence to the contrary, that idea often appears today. Bitot's spots are such easily recognized lesions that nutrition surveys may conveniently record their presence in large population studies. It is, therefore, important to appreciate the limitations of this conjunctival sign.

Part of the text of this paper is a synopsis of material submitted for publication elsewhere (1); some additional data obtained by McLaren in Tanganyika are also included. We have tried to present as briefly as possible the controversial status of Bitot's spots—particularly as this per-

tains to the interpretation of results of nutrition surveys.

Bitot's spots are grossly visible, discrete, and generally bilateral conjunctival changes—usually located temporally near the corneal limbus (see illustration). When large, they are typically triangular in shape, the apex pointing toward the outer canthus, although they exhibit considerable variation in size and configuration. Due to their foamy substance Bitot's spots have a characteristic refractile silvery-gray hue. If the foamy consistency is not pronounced they may appear as lusterless, finely striated plaques.

Occasionally individuals who do not show Bitot's spots may present identical material smeared along the lid margin or heaped at the outer canthus. Pinguecula, a lesion with a predilection for the same site on the bulbar conjunctiva as that of Bitot's spots, is a more common finding in any population and of no value as an indicator of nutritional deficiency. This lesion is yellowish or partially pigmented, and though elevated its substance lies beneath the epithelium. Moreover, it is less well demarcated and more solid in appearance than Bitot's spots and frequently occurs both nasally and temporally.

Neither pingueculae nor Bitot's spots produce symptoms, and in themselves they require no treatment. Pingueculae are found most commonly in adults, but in populations subject to exposure, they may occur with increased frequency in younger age groups. Bitot's spots

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keratinization. These nutritionally normal people do not have Bitot's spots.

Conjunctival scrapings for the study of keratinized cells have not proved useful in detecting early changes from vitamin A deficiency, for the normal range in amount of keratinization is too great (18). Therefore, conjunctival xerosis as recorded in surveys should be regarded as a stage of keratinization which has become clinically manifest. From experimental work on hypovitaminosis, it is clear that this change in the epithelium can result from avitaminosis A, but to consider all clinical xerosis indicative of vitamin A deficiency would be incorrect. In contradistinction, keratomalacia, which is a rapid swelling and necrosis of the cornea found almost exclusively in infants, is a more specific evidence of vitamin A deficiency. Timely administration of vitamin A may produce a gratifying response.

Our own recent observations in Ethiopia and Tanganyika corroborate previous reports which have failed to show a correlation between vitamin A deficiency and Bitot's spots.

### Ethiopia

Seventeen hundred and ninety school children in Addis Ababa, Ethiopia, were examined for Bitot's spots in March 1959. Fifty-one were found to have the lesions, an incidence of 3.3 percent among the boys and 1.8 percent among the girls. The ages of the children examined varied over a wide range with an average of 12.3 years, about the same as the average age of those having Bitot's spots. Although the diet of these children was inadequate in several respects, general physical examinations performed on all those with Bitot's spots and a random sample of those without did not show gross

**Table 1. Serum vitamin A and carotene levels in school children with and without Bitot's spots, four examinations, Ethiopia, 1958-59**

Test item	Children with Bitot's spots				Children without Bitot's spots			
	School 1	School 2	School 3	Total	School 1	School 2	School 3	Total
<i>September 1958</i>								
Number of children	3	2	-----	5	28	11	12	51
Mean serum vitamin A (mcg./100 ml.)	20.3	23.4	-----	21.5	23.8	20.2	25.8	23.4
Mean serum carotene (mcg./100 ml.)	123.9	111.3	-----	118.9	129.8	103.4	152.3	129.4
<i>November 1958</i>								
Number of children	16	11	8	35	27	16	12	55
Mean serum vitamin A (mcg./100 ml.)	24.0	22.8	28.5	24.7	23.4	29.0	25.7	25.5
Mean serum carotene (mcg./100 ml.)	151.4	115.6	171.4	144.7	129.2	115.7	147.3	129.2
<i>March 1959</i>								
Number of children	12	12	8	32	27	10	8	45
Mean serum vitamin A (mcg./100 ml.)	13.4	22.3	25.0	19.6	14.3	12.9	22.8	15.5
Mean serum carotene (mcg./100 ml.)	125.9	154.0	184.0	150.9	154.9	179.1	150.4	159.5
<i>June 1959</i>								
Number of children	19	8	6	33	18	34	12	64
Mean serum vitamin A (mcg./100 ml.)	19.4	25.5	20.7	20.9	20.6	28.4	18.7	25.7
Mean serum carotene (mcg./100 ml.)	121.8	92.0	115.4	113.4	117.0	121.9	132.0	122.4

NOTE: School 1 children received skim milk and vitamin C; school 2 children, skim milk and vitamin A; school 3 children received no dietary supplements.

signs of specific deficiency disease. Compared with the bulbar conjunctivae of healthy American school children, the conjunctivae of all these Ethiopian children showed alterations, but the estimated severity of xerosis indicated by the degree of conjunctival wrinkling or dryness was not significantly different in the group with Bitot's spots from that in the group without the spots.

Night vision testing, using a modified radium plaque device (American Optical Instrument Co., U.S. Navy specifications), was performed, also in March 1959, on 244 of these Ethiopian children. Of this group, 28 had Bitot's spots

and 216 were without the spots. Standards for comparison were obtained by using the same instrument under comparable conditions to test a group of 77 American school children in Bethesda, Md. Based on these standards, no evidence of impaired night vision was found in any of the 244 Ethiopian children tested.

At three schools near Addis Ababa, serum carotene and vitamin A levels were determined on children with and without Bitot's spots in a series of four examinations (19). After the first examination children in school 2 (table 1) received supplements of 8,000 I.U. of vitamin A for 5 days per week for 6 weeks, whereas those

**Table 2. Observations of Bitot's spots in 10 patients at the Church Missionary Society Leprosarium, Makutapora, Tanganyika, in connection with vitamin A trial, 1959**

Patients		Observed state of lesions					
Sex	Age (years)	June 25, 1959	July 17, 1959	August 28, 1959	September 25, 1959	October 22, 1959	January 18, 1960
Female	40	Left lateral material approximately 3x3 mm. no definite shape, scattered foam	-----	No spot	-----	Few small spots again	Few small spots still present
Male <sup>1</sup>	20	Right lateral 6x3 mm. heavy accumulation	ISQ	-----	Very faint now. Left eye now has faint striations	Right eye and left eye ISQ	Large amount of material lateral and bilateral
Female <sup>1</sup>	25	Right lateral patch of foam on a larger white area	ISQ	Much diminished	No further change	Still present	ISQ but only raised, no foam
Male	29	Left lateral dumbbell-like area of material	-----	No spot	-----	Returned and increased	Still larger
Male <sup>1</sup>	8	Right lateral two flecks of foam only	No spots	One small fleck	-----	-----	ISQ
Male <sup>1</sup>	40	Right medial three small areas on pinguecula	Doubtful if present	Definitely present again	-----	ISQ	ISQ
Male <sup>1</sup>	26	Left lateral two definite spots	ISQ	Complete disappearance	-----	-----	Two large spots, no foam
Male <sup>1</sup>	30	Left medial one small spot	-----	Minute	Nothing seen	Spot returned	Left leprosarium
Male	30	Left lateral pinhead spot	-----	Nothing seen	Small spot seen	Small spot, both eyes laterally	ISQ
Male	40	Left lateral appreciable size	ISQ	Left leprosarium	-----	-----	-----

<sup>1</sup> Patients receiving vitamin A therapy.  
ISQ = In status quo.

This erratum is for the purpose of correcting the figures for mean serum vitamin A contained in Table 1, page 740.

keratinization. These nutritionally normal people do not have Bitot's spots.

Conjunctival scrapings for the study of keratinized cells have not proved useful in detecting early changes from vitamin A deficiency, for the normal range in amount of keratinization is too great (18). Therefore, conjunctival xerosis as recorded in surveys should be regarded as a stage of keratinization which has become clinically manifest. From experimental work on hypovitaminosis, it is clear that this change in the epithelium can result from avitaminosis A, but to consider all clinical xerosis indicative of vitamin A deficiency would be incorrect. In contradistinction, keratomalacia, which is a rapid swelling and necrosis of the cornea found almost exclusively in infants, is a more specific evidence of vitamin A deficiency. Timely administration of vitamin A may produce a gratifying response.

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	School 1	School 2	School 3	Total	School 1	School 2	School 3	Total
<i>September 1958</i>								
Number of children.....	3	2	-----	5	28	11	12	51
Mean serum vitamin A (mcg./100 ml.).....	36.1	41.6	-----	38.3	42.3	35.9	45.9	41.7
Mean serum carotene (mcg./100 ml.).....	123.9	111.3	-----	118.9	129.8	103.4	152.3	129.4
<i>November 1958</i>								
Number of children.....	16	11	8	35	27	16	12	55
Mean serum vitamin A (mcg./100 ml.).....	42.7	40.6	50.7	44.0	41.7	51.0	45.7	45.3
Mean serum carotene (mcg./100 ml.).....	151.4	115.6	171.4	144.7	129.2	115.7	147.3	129.2
<i>March 1959</i>								
Number of children.....	12	12	8	32	27	10	8	45
Mean serum vitamin A (mcg./100 ml.).....	23.9	39.6	44.4	34.9	25.4	22.9	40.5	27.5
Mean serum carotene (mcg./100 ml.).....	125.9	154.0	184.0	150.9	154.9	179.1	150.4	159.5
<i>June 1959</i>								
Number of children.....	19	8	6	33	18	34	12	64
Mean serum vitamin A (mcg./100 ml.).....	34.6	43.3	36.9	37.1	36.6	50.6	33.2	43.5
Mean serum carotene (mcg./100 ml.).....	121.8	92.0	115.4	113.4	117.0	121.9	132.0	122.4

NOTE: School 1 children received skim milk and vitamin C; school 2 children, skim milk and vitamin A; school 3 children received no dietary supplements.

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## Guide for Community Psychiatric Clinics

A new 309-page volume issued by the New York State Department of Mental Hygiene under the title "A Guide to Communities in the Establishment and Operation of Psychiatric Clinics" brings together concrete answers to some of the numerous practical questions confronting those who set up and maintain community psychiatric clinics. Emphasis is on proved standards, and attention is given to choice of auspices, problems of cost and equipment, selection of suitable personnel, formulation of policy and handling of administrative issues. Appendix material includes illustrative forms and guides, budgets, fee scales, and the like, as well as copies of the laws, regulations, and official documents which provide the supporting network by means of which some 300 licensed clinics are able to operate currently in New York State.

The guide is based on the extensive clinical and field consultation experience of the authors, Luther E. Woodward, Ph.D., senior mental health representative, and Winifred W. Arrington, M.S.S., mental health representative, in the division of community services of the New York State Department of Mental Hygiene.

The book may be purchased from the Division of Community Services, New York State Department of Mental Hygiene, 240 State Street, Albany, N.Y.

**Table 3. Percent incidence of Bitot's spots, xerophthalmia, and keratomalacia among children examined in Tanganyika, March 1959**

Item	Mvumi		Mwanza	
	Male	Female	Male	Female
<i>School children</i>				
Number examined.....	670	395	331	114
Percent incidence:				
Bitot's spots.....	0.4	0.5	1.8	0
Xerophthalmia.....	0.3	0.2	0	0
<i>Preschool children</i>				
Number examined.....	232	236	-----	-----
Percent incidence:				
Bitot's spots.....	0	0	-----	-----
Xerophthalmia.....	8.2	5.5	-----	-----
Keratomalacia.....	1.7	0.8	-----	-----

in the other two schools did not. Eight weeks after the second examination supplementation was discontinued. Supplementation was resumed after the third examinations. The distribution of levels of serum vitamin A and carotene in individuals with Bitot's spots followed the same pattern found throughout the country in the initial survey of over 8,000 persons.

This relatively short-term study has failed to reveal any effect on Bitot's spots from vitamin A administration.

### Tanganyika

Subsequent to our work in Ethiopia, further observations of Bitot's spots in relation to vitamin A were made on a smaller scale in Tanganyika.

A trial of vitamin A therapy, supervised by Dr. K. R. Dalley, was undertaken with a few patients at the Church Missionary Society Leprosarium at Makutapora in 1959. Ten patients with Bitot's spots were divided into two groups for treatment and observation. During the trial period, June 25–October 14, six patients received 150,000 I.U. of vitamin A twice weekly under the supervision of a European nurse. Four patients received no vitamin A supplement.

The Bitot's spots of patients in both groups

were observed several times during the trial and again 3 months after vitamin A therapy had been stopped (table 2). Though the conjunctival lesions varied considerably from one observation period to another (similar variations occurred in the individual Ethiopian school children with Bitot's spots during the 9 months of observation), there was no difference in the pattern of variation in individuals treated with vitamin A as compared with those untreated. Nor did vitamin A blood levels show differences between the two groups. The night vision of seven of the patients showed no impairment.

In Mwanza, Tanganyika, on the shores of Lake Victoria, there is no food shortage. At Mvumi, Tanganyika, in the dry central Province where famine has been frequent, there is dietary deficiency of vitamin A and protein. The occurrence of Bitot's spots among school children in these two areas was 5 cases in 1,065 children examined in Mvumi and 6 cases in 445 children examined in Mwanza—at least as many spots in Mwanza as in the nutritionally less fortunate region (table 3). Among 468 preschool children in Mvumi, keratomalacia had occurred in 6, whereas in Mwanza during 2 years of pediatric, ophthalmic, and nutritional hospital practice, not a single case has been discovered. In Addis Ababa, for another example, keratomalacia is said to be rare. No case was seen during the nutrition survey of Ethiopia in 1958 (19). Therefore, keratomalacia, the more specific indicator of vitamin A deficiency, and Bitot's spots are not necessarily associated occurrences.

This conclusion is worthy of emphasis. There need be no correlation between the presence of Bitot's spots and hypovitaminosis A. For this reason, the convenience of recording Bitot's spots in nutritional surveys must not tempt workers into assigning a specific interpretation to these lesions. Like other clinical signs, the nutritional significance of the lesion must be evaluated in conjunction with other evidence.

### REFERENCES

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- (2) Bitot, P.: Sur une lésion conjonctivale non encore

the county are dispersed throughout the rural area. The county seat has a church, a club, and a movie theater. There are 21 rural schools in the county, maintained by the county government. Official statistics show that 12.8 percent of the population above the age of 10 is illiterate. Government health services reach the rural dwellers only when they go to health centers in the towns. Federal and State agricultural services give some help to farmers.

Since ACAR works mostly with the small landholder, the pilot survey was limited to this group. These farmers generally have 20 to 50 hectares (49 to 123 acres) of land, and this was adopted as the main criterion for the selection of the 54 families to be studied. For borrowers, accurate information on size of property was available at the ACAR office in Sete Lagoas; for non-borrowers and the control group, the only information available was in the tax collector's office. These records were not always accurate because, for tax reasons, farmers often understated the size of their property. Size of property, however, is not always the best measure for selecting a sample of families of the same economic level, since economic values of land depend on its fertility and the use the owner makes of it. Usage as well as amount of land was considered in selecting an economically homogeneous sample.

### Participants

In 1957, 54 families, composed of 419 persons, participated in the survey; in 1958, only 50 families, composed of 344 persons, took part. Four large families had moved or were absent from the county during the second survey. The mean number of persons per family was 7.7.

The 54 families selected for study represent only 26 percent of all property owners in the county, and 49 percent of these are submarginal. They were divided into three groups of 18 families each, as follows:

Group 1. ACAR borrowers: All families in Jequitibá receiving financial as well as technical assistance from ACAR were included.

Group 2. Non-borrowers: Families were chosen from the larger number in the county to which ACAR was providing technical but not financial assistance. They were selected on

### Definitions

The Associação de Crédito e Assistência Rural (ACAR) is an extension organization which began work in 1949, using supervised credit as one of the tools in its rural development program. It was founded jointly by the Minas Gerais State Government and the American International Association for Economic and Social Development (AIA), a Nelson Rockefeller nonprofit entity. At the end of 1958, ACAR had more than 60 local offices in the rural areas of Minas Gerais, each office being staffed by a farm supervisor and a home economist.

Escritório Técnico de Agricultura Brasil-Estados Unidos (ETA) is a joint project of the U.S. Government's point 4 organization and the Brazilian Ministry of Agriculture, working in many fields of agricultural improvement in Brazil. It has participated in ACAR since 1955, making major contributions in both funds and technical assistance.

the basis of their socioeconomic similarity to the borrower families, and the location of their properties in areas similar to those in which the other groups lived.

Group 3. Families having no contact with ACAR and living on the east bank of the river: These were chosen by lot after eliminating all families living on farms of 20 to 50 hectares which were difficult to reach or were very dissimilar to the farms in the other two groups.

Before starting collection of the data, each of the three doctors on the survey team examined the same 20 boys in an orphanage in Belo Horizonte and compared their findings in order to determine individual variations in grading and to obtain close agreement on diagnostic criteria. This assured a high degree of uniformity in the clinical examinations. All three physicians had previous training in clinical nutrition. Since the women on the team had worked as home economists of ACAR for 1 year or more, they were reasonably well prepared for their part in the survey. Before starting the collection of the data, the members of the team were given detailed instructions on the techniques to be used.

The survey team began collecting the following data in July 1957:



# Nutritional Survey of Rural Families in Jequitibá, Brazil, 1957-58

FRANK W. LOWENSTEIN, M.D., D.P.H.



In 1956, I was asked to plan and help organize a nutritional survey in several areas of the State of Minas Gerais, Brazil, in which ACAR was working. The request was made by the directors of ETA. The survey was conducted to find out what the people were eating and to determine their general health and nutritional status as a basis for planning an educational program in nutrition and health to be executed by the ACAR field staff.

After an orientation trip in May 1956 through various regions in which ACAR was working, it was decided to make a pilot survey near Sete Lagoas, 60 kilometers (37½ miles) north of Belo Horizonte and the site of an ACAR office. The following criteria were used in the final selection of the area:

1. It should be readily accessible to researchers operating from a convenient base.
2. It should be a typical work area of ACAR, with families of borrowers and non-borrowers more or less evenly distributed. (The term "borrowers" refers to families receiving both technical and financial assistance from ACAR; "non-borrowers," to those receiving technical but not financial assistance from ACAR.)
3. There should be enough other families of

approximately the same economic level in the area who had never been in contact with ACAR to form a kind of control group.

Jequitibá, the county neighboring on Sete Lagoas to the north and east, fulfilled those criteria and was selected as the survey area. Jequitibá lies on both sides of the Rio das Velhas, which flows from southeast to northwest. ACAR technicians from the Sete Lagoas office were working with families living west of the river but with none on the east side.

The average elevation in Jequitibá is between 650 and 750 meters (2,140 to 2,460 feet) above sea level. Most of the area is rugged, hilly country. Soil fertility varies from good to very poor. The climate is generally agreeable, with only small differences in temperature from summer to winter. Rainfall is concentrated from November to April and is much less than in the southern part of the State.

The principal crops are corn, rice, beans, sugarcane, and manioc (cassava). Beef and dairy cattle, hogs, horses, mules, and poultry also are produced. Milk production reaches 2.2 million liters (nearly 2.3 million quarts) per year, most of which goes to the creamery in Sete Lagoas for making butter, cheese, and dried milk. The small amount of home industry consists mainly of primitive installations to grind corn and manioc and to make raw sugar.

More than 80 percent of the 10,390 people in

*Dr. Lowenstein is with the nutrition unit of the World Health Organization, Geneva, Switzerland.*

were treated in the same way as those from the first survey, and a comparison was made between the two.

Table 1 shows for both surveys the age and sex distribution of persons in the three study groups who were examined by a physician. The age distribution for females was similar in the three groups, but there were considerably more males between 1 and 14 years of age in groups 2 and 3 than in group 1.

The distribution by color was similar in the three groups, with a slight preponderance of the white color over the mixed color (*pardo*) among the males of groups 1 and 2 and among the females of group 3. There were only nine individuals of true black color (two males and seven females).

About two-thirds of all the families had lost between one and five children through illness. More than one-fourth (27.1 percent) of all persons examined had already lost either father or mother or both.

More than three-fourths (78.7 percent) of all persons above the age of 6 were able to read and write, with group 1 showing the highest number. However, 9 percent did not give information on literacy.

The great majority of the men were farmers, and most of the women were housewives. Group 1 had the highest median income per family and group 3 had the lowest, whereas the total median expenses per family were highest in group 2. Table 2 shows median incomes and expenses per family in the three groups for 1956, given in cruzeiros, the Brazilian currency. At that time 1 U.S. dollar would bring about 70 cruzeiros.

### Housing and Sanitation

The majority of the homes of families in groups 1 and 2 are built of bricks, whereas most of the homes of group 3 families are of adobe. The number of rooms varies from 4 to 19, with the median between 9 and 10 (usually 3 sleeping quarters) in all three groups. This seemingly high median should not be taken to indicate that the houses are comparable to 9- or 10-room homes in more developed parts of the world. Usually the rooms are small, sparsely furnished, and far from luxurious. The conditions of the home, kitchen, and stove are presented in table 3.

**Table 3. Conditions of home and kitchen of 54 families in Jequitibá, Brazil, 1957-58**

Unit	Percent		
	Good	Fair	Poor
Home in general (all groups)-----	20. 4	55. 6	24. 0
Kitchen (all groups)-----	5. 6	57. 4	37. 0
Stove (kitchen):			
Group 1-----	33. 3	44. 4	22. 3
Group 2-----	16. 7	50. 0	33. 3
Group 3-----	11. 1	38. 9	50. 0

A kitchen classified as "good" had: floor made of tiles, wood, or cement; clean, well-kept walls; closed cupboards for utensils, dishes, and food; adequate equipment for preparing and serving food; at least one window; an appropriate table or space to work; jars with tops for storage of staples (sugar, flour, coffee, beans, rice); and a stove with a chimney and oven. One described as "fair" was in passable but not in good condition, or lacked one of the listed items. A kitchen classified as "poor" was in generally bad condition, or lacked two or more of the listed items.

A stove called "good" was well kept, functioning well, with chimney and oven. A "fair" stove was in passable but not good condition, with either chimney or oven lacking. A "poor" stove lacked more than one item.

Sanitary conditions in the majority of homes were basically poor. The source of water for 63 percent of the families was a shallow creek; for 27.8 percent, a well; and for 9.2 percent, a spring. Water filters were used by 55.6 percent of the families in group 1, 11.1 percent of those in group 2, and 16.7 percent in group 3. Water samples were collected from 12 sources of supply and analyzed for fluorine content at the laboratory for water analysis of the State of Minas Gerais. All samples were distilled and then examined by standard methods. The fluoride content per 1,000 liters of water ranged from 0 to 0.7.

Only 38.9 percent of the families in group 1 and 16.7 of those in group 2 had privies; there were none in group 3.

The great majority of the homes in all three groups were without running water, electricity,

**Table 1. Age and sex distribution of persons examined by a physician by study group,<sup>1</sup> 54 families in Jequitibá, Brazil, 1957 and 1958**

Age group (in years)	Group 1				Group 2				Group 3			
	Male		Female		Male		Female		Male		Female	
	1957	1958	1957	1958	1957	1958	1957	1958	1957	1958	1957	1958
Less than 1.....	3	0	0	0	1	0	0	0	0	0	0	0
1-4.....	4	5	9	8	15	11	7	7	11	8	4	4
5-9.....	10	7	12	8	17	12	9	9	15	11	10	9
10-14.....	5	5	7	9	10	9	11	8	10	8	8	4
15-19.....	8	7	8	6	6	4	12	7	4	1	10	6
20-29.....	11	11	9	8	1	0	5	7	3	3	14	12
30-39.....	5	6	7	6	4	5	7	6	4	3	3	2
40-49.....	8	7	4	3	7	6	4	3	4	3	7	7
50-59.....	2	2	4	4	3	1	2	2	4	3	2	2
60 or over.....	4	2	2	2	1	1	2	1	0	0	0	0
Total.....	60	52	62	54	65	49	59	50	55	40	58	46

<sup>1</sup> Group 1, borrowers from ACAR; group 2, non-borrowers; group 3, no contact with ACAR.

1. Reports on general socioeconomic conditions of the families, including conditions in the homes, were collected by the home economists on their visits.

2. Information on habits, superstitions, and food taboos were recorded by the home economists.

Seven-day food-consumption records of the families were kept daily by the housewife after instruction was given by the home economist, who later checked the records when she visited the family. (On the average, three visits were made during the week of the survey.)

4. Individual food intake was recorded during 3 weekdays. These records were checked on the first day by the home economist who weighed and measured individual portions of food and recorded the data on individual forms. On the other 2 days either the housewife or another responsible person did the weighing, measuring, and recording.

5. Data on the nutritional and health status of each individual were collected by the physician during an inspection of the home and recorded on a special form. Clinical examinations were supplemented by laboratory examinations of blood and fecal specimens. The hemoglobin was measured in blood specimens of all children aged 2 to 16 years by a laboratory technician who went to the home. Fecal samples were collected in the homes and

brought to the State public health center in Sete Lagoas, where they were examined for parasites.

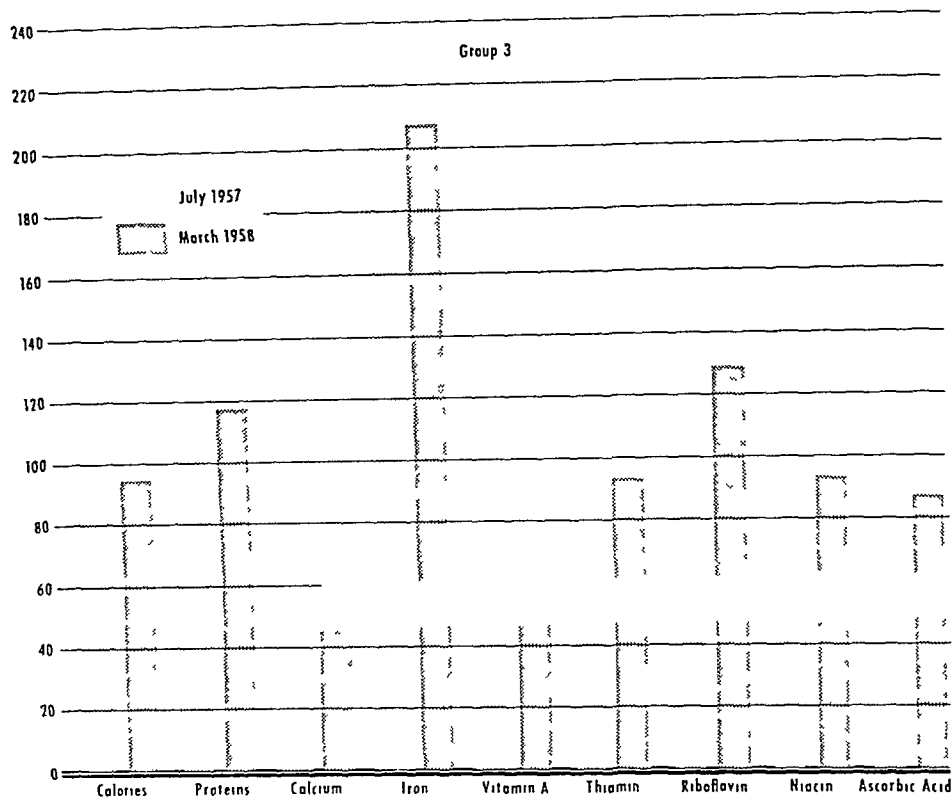
Reports of the examinations were sent to Serviço Especial de Saúde Pública, a Brazilian-American governmental agency working in public health in Rio de Janeiro, where they were tabulated in accordance with detailed instructions.

To determine whether some of the clinical findings were due to seasonal variations in the diet of these families, early in March 1958, 8 months after the first survey, a followup survey was made of the same families visited in July 1957. Data collected during the second survey consisted of 7-day food-consumption records and results of a second clinical examination in the homes, including laboratory tests for hemoglobin and parasites in the stool. These data

**Table 2. Income and expenses, in cruzeiros, of 54 families in Jequitibá, Brazil, 1956**

Income and expenses	Group 1	Group 2	Group 3
Median annual income.....	46,393	34,500	26,800
Total expenses.....	15,815	24,470	11,670
Home and fuel.....	2,775	5,370	1,450
Food.....	6,250	13,100	6,170
Medical care, including drugs.....	2,000	1,500	1,050
Other.....	4,820	4,500	3,000

in relation to "normal" requirements for two seasons, July 1957 and March 1958



and radio, but did have sewing machines. More than 50 percent of the homes in groups 1 and 2 had a storeroom for food supplies whereas only 17 percent in group 3 had such rooms.

#### Food Economics

Expenditures for food were highest in group 2, while medical expenditures were highest in group 1 (table 2). In groups 1 and 3 the lowest earners spent a significantly higher percentage of their income for food than the highest earners. In group 2 these differences were less pronounced (table 4).

Table 4. Percentage of annual income spent for food by 54 families in Jequitibá, Brazil, 1956

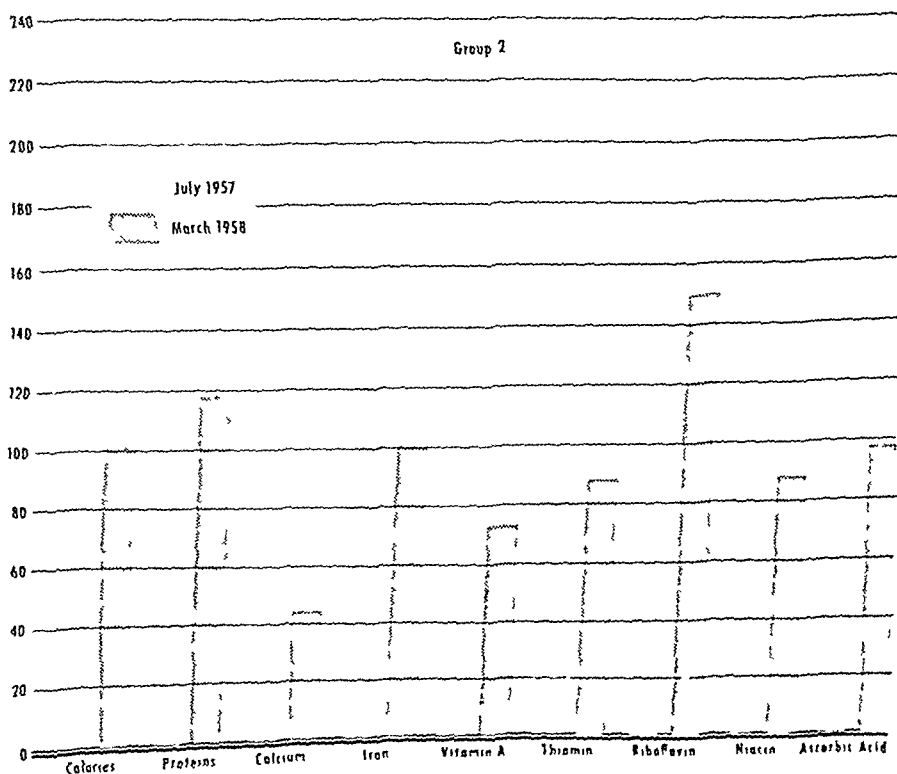
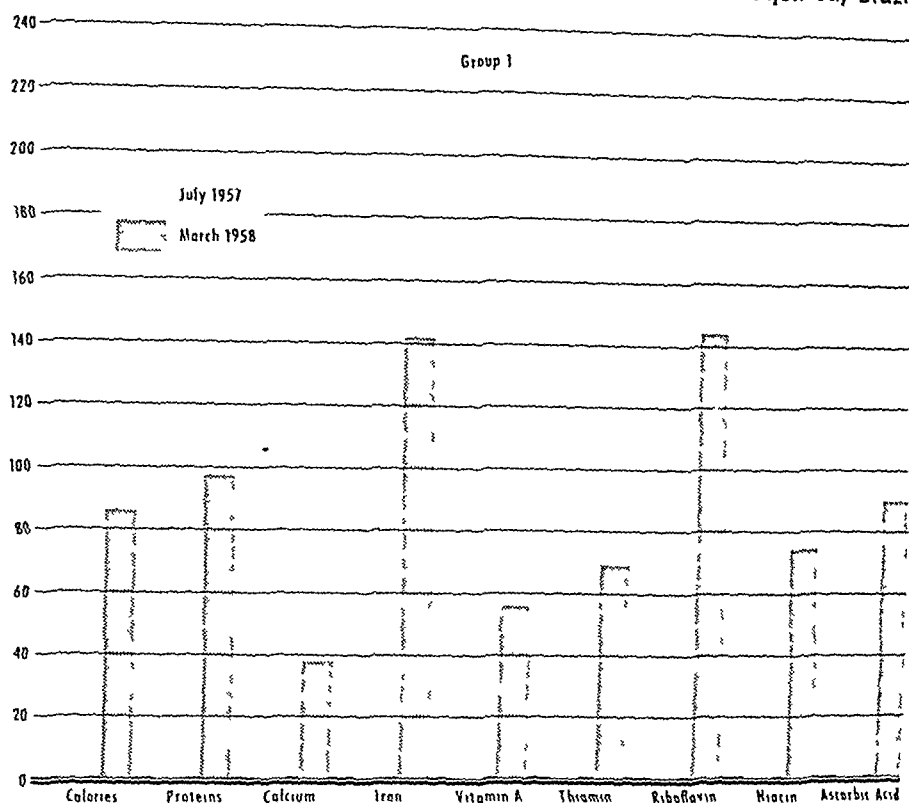
Income group (cruzeiros)	Group 1	Group 2	Group 3
5,000-17,500	45.7	25.1	51.8
18,000-45,000	12.6	48.0	58.7
46,000-70,000	20.0	57.3	22.0
71,000-220,000	7.7	13.7	7.7

In order to see how the housewives spent their food cruzeiros, the investigators asked them to record the price of each item bought. About 20 percent of the daily food bill was spent for fats and oils (except butter), 12 percent for sugar, between 12 and 20 percent for meat, and between 10 and 12 percent for coffee. For all other items, they spent less than 10 percent.

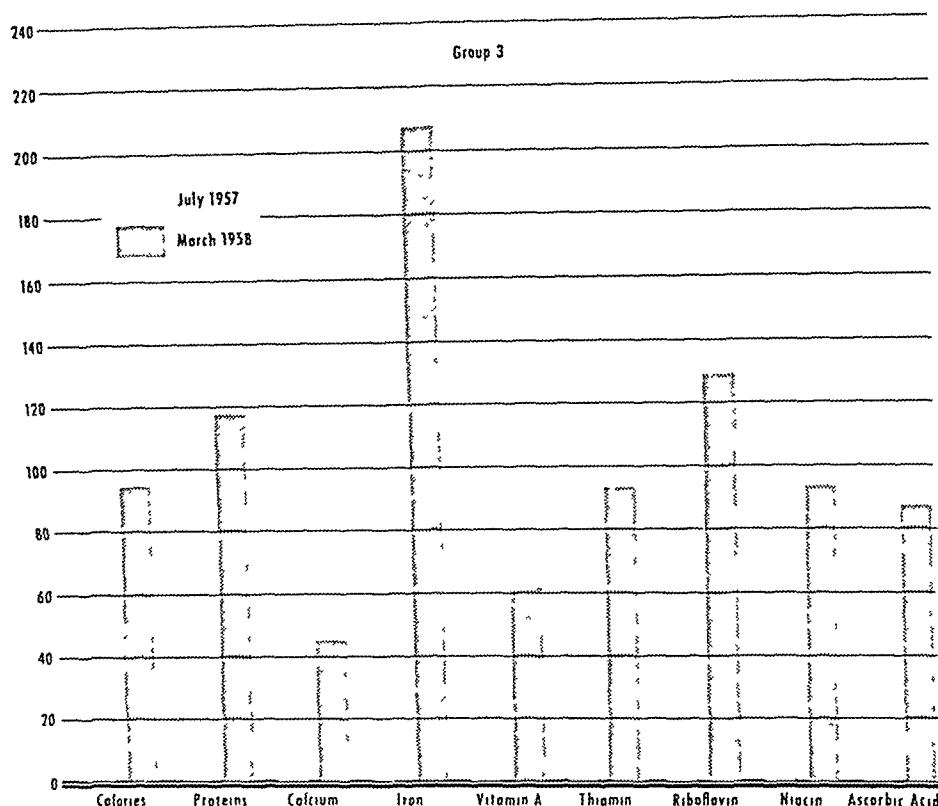
All families raised some animals for food; most of them had chickens, pigs, and a few cows. Few families supplemented their meat supply through hunting, although some did fish (61 percent in group 2).

In July, the dry season, when the first survey was made, no family was without a vegetable garden, but most gardens contained only a few varieties, such as lettuce, onions, parsley, tomatoes, collards, and garlic, generally in small amounts. More families in group 1 planted these vegetables than in groups 2 and 3. Only a few families planted such vegetables as yellow squash, carrots, sweet peppers, and soybeans. The picture changed in March at the end of the rainy season, when there were

Percentage of mean nutritive values consumed by 54 families in Jequitibá, Brazil,



in relation to "normal" requirements for two seasons, July 1957 and March 1958



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more vegetables and more varieties. Fruits grew in all yards, though only a few varieties. Almost all families had orange trees, some had banana plants, and only a few had guava, papaya, and avocado trees, with more families in group 1 having the last three.

### Food Habits and Taboos

In their preference for specific foods, all three groups showed much uniformity, although more families in group 1 gave vegetables and eggs as their preferred foods than in the other two groups. Percentages of all 54 families preferring specific foods follow:

	Percent
Beef .....	87.0
Rice .....	72.2
Macaroni .....	59.3
Beans (dried) .....	59.2
Vegetables in general .....	35.2
Eggs .....	29.6
White potatoes .....	27.7

Chicken was considered Sunday fare by 77.7 percent of the 54 families; macaroni, by 42.5 percent; and sweet desserts, by 26.7 percent. Families in group 2 showed a higher preference for macaroni on Sundays and holidays than those in the other two groups. Whereas four families in group 1 used the same type of food on Sundays as on weekdays, only one family in group 2 and one in group 3 did so. Leftovers were used by the great majority of the families either for supper or for feeding animals. Most families considered protein foods and vegetables of greater nutritional value than starchy foods (table 5).

There were some differences among groups in describing the "nature of food." For example, none of the families in group 3 called collards "hot"; only three families, 16.7 percent, in group 1 called pork "hot"; strawberries were called "hot" by 27.8 percent of the families in group 1 only. Rice was called "cold" by only 22.2 percent of the families in group 3. One third of the families in group 1 called manioc meal "cold." Only 11 percent of the families in group 2 called tomatoes "cold." The terms "hot" and "cold" are unexplainable since they do not refer to seasoning nor to temperature. More families in group 3 than in the other two groups, 83.3 percent, called black

Table 5. Nutritional evaluation of foods by 54 families of Jequitibá, Brazil, 1957

Food	Percent of families that consider food—	
	Of nutritional value	Without nutritional value
Beef .....	46.3	0
Beans (dried) .....	38.9	3.7
Eggs .....	38.9	0
Vegetables in general .....	37.1	0
Milk .....	27.8	0
White potatoes .....	24.1	0
Rice .....	9.3	61.1
Macaroni .....	11.1	24.1
Manioc meal .....	2.0	18.5

beans "heavy," but only 11.2 percent called eggs "heavy." Yellow squash was considered a "food of the poor" by three times as many families in group 1 as in group 3. Rice was considered a "food of the rich" by 38.9 percent of the families in group 3, but by none in the other groups. Macaroni was called a "food of the rich" by 50 percent of the families in group 2. Table 6 shows how the families in all three groups ranked food by this folk designation.

The following food taboos were observed by the families:

Taboos	Percent of 54 families
Did not take milk with fruits .....	59.3
Did not change diet during influenza illness .....	62.9
Did not take fruits during fever .....	48.2

Considerably fewer families in group 1 than in groups 2 and 3 did not change their diet when they had the "flu" (44.4 percent compared with 72.7 percent), whereas more families in group 1 did not eat fruits during fever.

Mothers in the 54 families abstained from certain foods immediately after parturition as follows:

Postnatal taboos	Percent of mothers
Did not eat fruits .....	74.1
Did not eat meat .....	29.6
Did not eat eggs .....	79.6
Did not drink milk .....	59.3

In group 2, 50 percent of the mothers did not eat fruit during the postnatal period, while in

group 3 the figure was 94 percent. In group 1, 50 percent ate no meat during that period, except chicken. Group 3 showed the highest percentage, 83.3 percent, of those who did not drink milk at that time, and group 2 the lowest percentage.

Foods desired during the postnatal period by mothers in the 54 families are listed in order of preference.

<i>Food preferred (not actual consumption)</i>	<i>Percent of mothers</i>
Chicken.....	83.2
Rice.....	46.3
Beans (dried).....	38.6
Pork.....	35.5
Macaroni.....	29.6

Rice was preferred by almost twice as many women in group 3 who had just given birth as in group 1; dried beans were preferred by fewer mothers in group 2 than in the other two groups.

#### Food Consumption

Data on daily food consumption were obtained for 53 of the 54 families in the survey in July 1957 and for 49 of the 50 families surveyed in March 1958. Individual diet records were checked in July 1957 by weighing cooked portions of food for 1 day.

#### *Seven-Day Family Diet Record*

In 1957 there were significant differences in food consumption, based on the *t* test at the 5

percent level, in the three groups in their consumption of white wheat bread, fresh beef, milk (liquid), yellow squash, Irish potatoes, white wheat flour, refined sugar, and raw sugar (table 7). Similar differences, found during the second survey in March 1958, represent part of the food pattern of the families in the three groups. The differences in the consumption of inham, bananas, oranges, papayas, and condiments, apparent in July 1957, disappeared largely in 1958.

Differences within the same group during the two seasons varied from group to group for such items as milk, tomatoes, guavas, and Persian limes. They may reach significance in one group, but show little in another. Table 8 shows the mean nutritive value per unit of nutrition (1) corresponding to the total consumption during the two seasons.

The graphs show the percentage of the National Research Council allowances (2) in comparison with the nutritional intakes given in table 8. These graphs clearly reflect the influence of seasonal differences on the nutrition of these families.

#### *Three-Day Individual Diet Record*

The individual diet records checked by weighing cooked portions of food for 1 day in July 1957 showed good agreement with the 7-day family records for the B vitamins in all three groups, for calories in groups 1 and 3,

Table 6. Designation of nature of foods by 54 families of Jequitibá, Brazil, 1957

Food	Percent of families that described food as—					
	Hot	Cold	Heavy	Light	Of the poor	Of the rich
Pork.....	33.3	0	0	0	0	0
Leaf cabbage.....	16.7	5.6	11.1	1.7	7.4	1.7
Peanuts.....	29.6	0	0	0	0	0
Yellow squash.....	16.7	1.7	1.7	3.7	22.2	1.7
Okra.....	20.4	0	0	0	9.3	1.7
Lettuce.....	0	72.1	0	7.4	1.7	1.7
Rice.....	0	40.7	7.4	33.4	70.6	20.4
Manioc meal.....	0	16.7	5.1	0	11.1	0
Tomatoes.....	0	22.2	0	3.7	1.7	1.7
Macaroni.....	0	7.4	3.7	16.7	12.9	31.5
Black beans.....	11.1	0	64.8	1.7	87.0	5.6
Eggs.....	3.7	0	27.8	0	7.4	9.3
White potatoes.....	0	9.3	0	9.3	1.7	16.7
Milk.....	0	17	0	37.1	1.7	7.4
Corn meal mush.....	0	1.7	0	46.3	3.7	0
Vegetables in general.....	0	0	0	5.6	22.2	11.1
Beef.....	1.7	0	11.4	1.7	11.4	64.8



more vegetables and more varieties. Fruits grew in all yards, though only a few varieties. Almost all families had orange trees, some had banana plants, and only a few had guava, papaya, and avocado trees, with more families in group 1 having the last three.

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Eggs .....	29.6
White potatoes .....	27.7

Chicken was considered Sunday fare by 77.7 percent of the 54 families; macaroni, by 42.5 percent; and sweet desserts, by 26.7 percent. Families in group 2 showed a higher preference for macaroni on Sundays and holidays than those in the other two groups. Whereas four families in group 1 used the same type of food on Sundays as on weekdays, only one family in group 2 and one in group 3 did so. Leftovers were used by the great majority of the families either for supper or for feeding animals. Most families considered protein foods and vegetables of greater nutritional value than starchy foods (table 5).

There were some differences among groups in describing the "nature of food." For example, none of the families in group 3 called collards "hot"; only three families, 16.7 percent, in group 1 called pork "hot"; strawberries were called "hot" by 27.8 percent of the families in group 1 only. Rice was called "cold" by only 22.2 percent of the families in group 3. One third of the families in group 1 called manioc meal "cold." Only 11 percent of the families in group 2 called tomatoes "cold." The terms "hot" and "cold" are unexplainable since they do not refer to seasoning nor to temperature. More families in group 3 than in the other two groups, 83.3 percent, called black

Table 5. Nutritional evaluation of foods by 54 families of Jequitibá, Brazil, 1957

Food	Percent of families that consider food—	
	Of nutritional value	Without nutritional value
Beef.....	46.3	0
Beans (dried).....	38.9	3.7
Eggs.....	38.9	0
Vegetables in general.....	37.1	0
Milk.....	27.8	0
White potatoes.....	24.1	0
Rice.....	9.3	61.1
Macaroni.....	11.1	24.1
Manioc meal.....	2.0	18.5

beans "heavy," but only 11.2 percent called eggs "heavy." Yellow squash was considered a "food of the poor" by three times as many families in group 1 as in group 3. Rice was considered a "food of the rich" by 38.9 percent of the families in group 3, but by none in the other groups. Macaroni was called a "food of the rich" by 50 percent of the families in group 2. Table 6 shows how the families in all three groups ranked food by this folk designation.

The following food taboos were observed by the families:

Taboos	Percent of 54 families
Did not take milk with fruits.....	59.3
Did not change diet during influenza illness.....	62.9
Did not take fruits during fever.....	48.2

Considerably fewer families in group 1 than in groups 2 and 3 did not change their diet when they had the "flu" (44.4 percent compared with 72.7 percent), whereas more families in group 1 did not eat fruits during fever.

Mothers in the 54 families abstained from certain foods immediately after parturition as follows:

Postnatal taboos	Percent of mothers
Did not eat fruits.....	74.1
Did not eat meat.....	29.6
Did not eat eggs.....	79.6
Did not drink milk.....	59.3

In group 2, 50 percent of the mothers did not eat fruit during the postnatal period, while in

much greater in group 3 than in groups 1 and 2, which may indicate less accuracy on the part of the housewives in group 3.

### Physical Examination and Laboratory Tests

The mean heights and weights for the adult males in all three groups are 169.3  $\pm$  7.8 cm. (5 ft. 6 in.  $\pm$  3 in.) and 60 kg.  $\pm$  9.30 kg. (132 lbs.  $\pm$  10 lbs.); for the females, 155.0  $\pm$  6.3 cm. (5 feet. 1 in.  $\pm$  2.5 in.) and 51.6  $\pm$  9.2 kg. (113.5 lbs.  $\pm$  20 lbs.). Table 9 shows the results of the physical examination during both surveys for the signs frequently associated with deficiency diseases.

The differences in physical findings between the groups during the first examination were not striking, except for xerosis of the skin, which occurred significantly less often in group 1 than in the other two groups. If one compared, however, the differences within the same group from one season to another, the picture

changed. The high incidence of follicular hyperkeratosis and xerosis of the skin dwindled to a very small figure in March 1958. Edema of the tongue and hypertrophy of the filiform papillae also diminished, whereas redness, edema, and bleeding of the periodontium showed a reverse trend, at least in groups 1 and 2. The possible causes for these changes will be discussed later.

The hemoglobin determinations on the blood in children aged 2 to 16 years showed that 45 percent had below 12 grams in July 1957, but only 26.9 percent were below that level in March 1958. Fewer than 10 percent had less than 10 grams in July 1957, and an even lower percentage were below 10 percent in March 1958. A new Sahli hemoglobinometer was used in the homes of the subjects for determining hemoglobin in fingertip blood.

Neck examination revealed a high incidence of endemic goiter in all three groups, with an average of 51.8 percent affected in 1957 and

**Table 9. Percentage of persons from 54 families of Jequitibá, Brazil, showing signs of deficiency diseases at examination**

Sign	Group 1		Group 2		Group 3	
	July 1957	March 1958	July 1957	March 1958	July 1957	March 1958
Paleness of mucosae.....	6.5	1.9	5.6	2.0	8.5	3.5
Skin:						
Follicular hyperkeratosis.....	39.5	17.5	43.5	5.9	35.1	8.1
Xerosis.....	32.6	4.7	50.8	2.0	52.1	2.3
Eyes:						
Thickening of conjunctiva.....	36.8	48.1	24.2	36.6	29.1	26.7
Spots on the conjunctiva.....	4.1	9.5	1.6	7.9	0	5.8
Circumcorneal congestion.....	45.9	68.9	52.4	68.3	36.8	52.3
Tongue:						
Edema.....	14.8	2.8	15.3	2.0	19.7	5.8
Fissures.....	14.8	9.5	7.3	8.9	12.8	17.4
Filiform papillae:						
Atrophy.....	9.0	1.9	2.4	4.0	4.3	2.3
Hypertrophy.....	34.0	15.2	24.2	10.9	21.3	8.1
Fungiform papillae:						
Atrophy.....	8.2	1.9	3.2	1.0	1.7	1.2
Hypertrophy.....	4.9	11.4	3.2	4.0	7.7	5.8
Teeth:						
Missing.....	50.0	47.2	35.5	32.7	37.6	31.4
Carious.....	50.0	58.5	65.3	68.4	60.0	62.8
Periodontium:						
Redness.....	4.1	21.7	6.5	13.9	10.3	7.0
Edema.....	3.3	30.2	5.6	18.8	17.1	7.0
Bleeding.....	1.6	10.4	4.8	6.9	5.1	8.1
Recession.....	22.1	17.9	15.3	7.9	18.8	9.3
Extremities:						
Curved legs.....	13.1	21.7	8.1	13.9	12.8	15.1
Increased calf tenderness.....	4.9	9.5	.8	6.9	8.5	12.4

<sup>1</sup> Differences significant at 5 percent level ( $X^2$  test used).

and for proteins in groups 2 and 3. They differed considerably in the values for calcium, iron, and particularly vitamin C, which showed values from 2 (in group 1) to 30 times (in group 3) as high in the individual diet records. This is explained by the amounts of oranges, Persian limes, and bananas recorded on the individual 3-day form, which in group 3 exceeded the amounts registered on the 7-day family rec-

ord by as much as nine times for oranges and three times for bananas. This brings out a serious error in family records based on the information that the housewife puts down daily by recall only. The error occurs most frequently in recording the fruits that are eaten between meals, particularly by children, often away from home, thus escaping the mother's attention. The differences found were usually

Table 7. Mean daily consumption of food per family in grams for 54 families in Jequitibá, Brazil, during two seasons, July 1957 and March 1958

Food	Group 1		Group 2		Group 3	
	July 1957	March 1958 <sup>1</sup>	July 1957	March 1958 <sup>1</sup>	July 1957	March 1958 <sup>1</sup>
White wheat bread.....	: 188		: 143		: 21	
Fresh beef.....	: 226		: 107		: 82	
Milk (liquid).....	: 1, 143	1, 367	: 779	1, 083	: 376	: 1, 081
Lettuce.....	: 38	0	: 103	0	: 64	0
Yellow squash.....	: 60	: 157	: 111	: 253	: 36	: 115
Irish potatoes.....	: 115		: 136		: 23	
Inhame (a tuber).....	17		89		50	
Bananas.....	: 7	: 295	: 85	: 236	: 24	: 193
Oranges.....	: 143	: 583	: 99	: 322	: 70	: 601
Papaya.....	93		20		48	
White wheat flour.....	: 36		: 140		91	
Condiments.....	57		5		14	
Refined sugar.....	: 369		: 345		: 138	
Raw sugar.....	: 88		: 124		: 523	
Okra.....	: 45	: 230	: 43	: 204	: 30	: 282
Tomatoes.....	9	7	39	18	24	7
Araticum.....	0	45	0	76	0	34
Lemons.....	1	18	1	24	2	13
Guava.....	0	126	0	192	0	38
Persian limes.....	0	45	0	54	0	3
Green corn.....	0	39	0	95	0	19
Avocado.....	0	158	0	83	0	43

<sup>1</sup> Some foods were not listed in 1958 because there was so little difference in the amounts consumed.

<sup>2</sup> Significance tested by the *t* test at 5 percent level.

Table 8. Mean nutritive values per unit of nutrition in 54 families of Jequitibá, Brazil, for two seasons

Nutritive values	July 1957			March 1958		
	Group 1	Group 2	Group 3	Group 1	Group 2	Group 3
Calories.....	2, 471	2, 793	3, 113	2, 759	3, 221	3, 057
Proteins (g.).....	72	73	73. 7	64	77	76
Calcium (mg.).....	221	172	129	318	355	367
Iron (mg.).....	14	16	26	17	12	25
Vitamin A (I.U.).....	2, 221	2, 760	2, 351	2, 813	3, 667	3, 050
Thiamin (mg.).....	1. 1	1. 3	1. 2	1. 1	1. 3	1. 5
Riboflavin (mg.).....	2. 0	. 9	1. 3	2. 3	2. 4	2. 1
Niacin (mg.).....	13. 0	14. 0	12. 0	12. 0	14. 8	15. 0
Ascorbic acid (mg.).....	38. 0	33. 0	3. 0	68. 0	74. 0	89. 3

people classify rice and beans as food "of the poor" and beef as food "of the rich," since beef is much more expensive than rice.

The most important finding in this field, however, was that a large percentage of persons had taboos which were not only unrealistic but might actually have been detrimental, promoting and prolonging ill health. Taboos relating to the postnatal diet may have serious consequences for the health and vigor of the nursing mother as well as the infant. During the postnatal period the mother should eat an abundant variety of protective foods, such as fruits, milk, and eggs; but the women studied restricted their diets to a few "preferred" items.

These taboos are confined neither to one area nor to one class. I have encountered the same taboos in other parts of Brazil, in both the north and the east. Their origin can be traced to Africa and to the Iberian Peninsula, the sources of most immigration to Brazil during colonial times. It is my impression, from limited knowledge of Brazilian Indians, that few if any of these taboos are of Indian origin.

The food consumption records during two different seasons showed a mild caloric deficiency but an adequate amount of protein, principally of vegetable origin. The supply of the B vitamins and vitamin C seems to be sufficient. A seasonal increase, particularly of riboflavin, appeared in March 1958, mainly because of greater milk consumption.

Iron intake was very satisfactory in groups 1 and 2 and excessively high in group 3 because of a heavy consumption of raw-sugar products. The satisfactory iron intake obviated iron deficiency anemia as a serious problem in spite of the high percentage of infestations of intestinal parasites, particularly hookworm. Such findings support Cruz' thesis (5) on the nutritional origin of hookworm anemia. Even the presence of the liver fluke (*Schistosoma*) in 26 percent of the persons examined in group 3 did not seem to have serious consequences in the infested persons as far as the clinical and hematological examination was able to reveal. The generally higher levels of hemoglobin in March 1958 cannot be explained on the basis of higher iron intake or lower infestation rate, because neither of these oc-

curred. The higher intake of ascorbic acid in March 1958 may have had some bearing on this change of hemoglobin levels.

The increase of redness and edema of the periodontium in March 1958 in groups 1 and 2 cannot be explained readily on the basis of nutrition because one might expect the opposite with a higher intake of foods rich in vitamin C.

The intake of vitamin A was low in all three groups during the winter, as shown in July 1957, but there was a seasonal increase during the summer, as shown in March 1958. This same phenomenon was observed with calcium, mainly because of higher consumption of milk and vegetables in March 1958. In spite of this seasonal increase, the intake of calcium and vitamin A remained considerably below National Research Council allowances (2). The same observations on calcium and vitamin A have been made in other parts of Brazil (6). They seem to be part of a general pattern.

The influence of seasonal supply on the consumption of various fruits, vegetables, and milk (table 7) does not need further comment. For some foods, the considerable differences between the intake based on the 7-day family record and the individual 3-day diet record checked by weighing individual portions pointed to the desirability of getting more individual diet records and also to extending the checking through day-by-day weighing and measuring of the raw foods used by the whole family during 7 days, with the home economist instructing and supervising the housewife during that time. Although more time consuming, this would result in more accurate data on actual food consumption by the family, as has been shown by experienced nutritionists in various countries (7).

The mean height of the men in this study was 3 cm. (1.17 inches) more than the mean given for the central area of Brazil by Medonça (8), their mean weight being the same. These men were taller than Medonça's mean for 2,281 men in Rio de Janeiro. The women, on the other hand, were 2 cm. (0.78 inches) shorter and somewhat lighter than Medonça's mean for 653 women. Comparison of the growth of the children of school age at Jequitibá with groups of the same age in Belo Horizonte (9) and

56.6 percent in 1958. The majority of the goiters were small grade 1 Kimball classification (3). However, a few very large grade 3 goiters were seen in adults, and two cases of cretinism were found. Females showed a higher incidence of goiter, particularly after puberty. Four families were goiter free in 1957, but no family was found without goiter in 1958.

Fecal samples were usually examined within 24 hours after collection of specimens at the public health post of the State health department in Sete Lagoas. Each sample was examined by the direct method and by the concentration method according to Faust (4). No quantitative determinations on the amount of parasites or egg counts were done. The results of the fecal examinations, done for only 57.3 percent of the persons examined in 1957 and 63 percent of the persons examined in 1958, are presented in table 10.

Group 3 had the lowest incidence of *Giardia lamblia* and *Ascaris lumbricoides* and the highest incidence of *Necator americanus* and *Schistosoma mansoni*. Incidence of *G. lamblia* increased markedly from July 1957 to March 1958, whereas the other parasites did not show such strong difference between seasons except for a decline in the *Ascaris* incidence in groups 1 and 3 and of *Schistosoma* in group 3. These decreases, however, were due to the medical treatment these people had received.

## Discussion

The county of Jequitibá where the survey was performed is a fairly typical county in north central Minas Gerais. The sample of 54

marginal farm families may be considered typical for this group; however, one must keep in mind that they represented only 26 percent of all property owners in the county (49 percent being submarginal), and that some bias may have occurred in the selection of some of the families, particularly in group 2, because of the usually underestimated size of their properties as recorded at the tax collector's office. The first impression, gained during the survey on the east side of the Rio das Velhas, that the families there (group 3) were living, in general, on a lower level than those in the other two groups, was confirmed by the result of the survey. Income and expenditures were lower; homes were in poorer condition; no privies and few storerooms were found. Group 1 usually led in such items as good condition of kitchen and stove and the possession of privies, water filters, and vegetable gardens. Here one could see the effect of educational work done by ACAR technicians over several years.

Information gathered on food habits and taboos threw some light on a very important but neglected field: the people's attitudes toward foods, which usually are formed early in life by traditions, customs, and beliefs. It revealed a realistic attitude in the expressed preferences for the foods they ate most.

The scale of nutritional values assigned to the various foods showed realistic understanding, too, in people who had not received any special training in nutrition. The designation of some foods (table 6) as "hot" or "cold" is puzzling, although it is understandable why people should call black beans "heavy" and rice "light," since beans are difficult to digest and the rice is easy. One can also understand why

Table 10. Percentage of persons found to have parasites during examination of members of 54 families in Jequitibá, Brazil

Group	Total examined both periods	Types of parasites							
		<i>Giardia lamblia</i>		<i>Ascaris lumbricoides</i>		<i>Necator americanus</i>		<i>Schistosoma mansoni</i>	
		1957	1958	1957	1958	1957	1958	1957	1958
1	38	18.4	47.4	23.7	10.5	60.6	62.9	0	1.1
2	29	17.2	44.8	37.9	34.5	66.7	62.5	1.5	0
3	19	5.3	15.8	21.1	0	79.7	72.4	26.3	5.3

showed disharmony in the proportions of the various foods, a situation which is common not only in many areas in Brazil but also in other countries. The diet of these families consisted of an abundance of concentrated carbohydrates, such as rice, manioc meal, macaroni, and sugar, in addition to some meat and dried beans, the principal sources of proteins. There was a lack of vegetables and fruits in general, even though their intake increased from one season to the other.

Clinical examinations in conjunction with the dietary findings can demonstrate clearly to these people that their health will improve with more milk, fruits, and vegetables at the end of summer (March) because of a greater intake of such essential nutrients as calcium and vitamins A and C. Such demonstrations can motivate them to plant more vegetables for their own use during the entire year and to preserve food to be eaten during the winter. They also should learn to use more milk at home, selling less.

In the course of a survey such as this, it becomes obvious that one cannot really separate the conditions of personal hygiene, sanitation, and nutrition because they all influence the level of health. Thus, any program of education executed by ACAR or a similar organization should include these three basic fields. It is also clear that before planning an educational program, a survey should be made. People will respond to such a program only if it is based on their own specific needs.

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Juiz de Fora (10), both in the south central area of Minas Gerais, revealed the same phenomenon, at least in the age group 7-12 years; the Jequitibá children were lighter in weight and taller. This made the influence of a racial factor likely.

The families in the three groups showed a remarkable physical similarity. The seasonal variations in physical characteristics which occurred in all of them were striking. The dry, rough skin found as xerosis and follicular hyperkeratosis in July 1957 is usually looked upon as a sign of vitamin A deficiency due to a very low intake of milk, fruits, and vegetables rich in vitamin A or carotene. With the higher intake of foods rich in vitamin A in March 1958, these skin signs diminished greatly. However, such signs as thickening and spots on the conjunctiva of the eye, also ascribed to vitamin A deficiency, did not show the same tendency; they increased slightly. But these eye changes usually respond much more slowly to dietary changes, if they are at all reversible.

The comparison of the food pattern as shown in table 7 brought out some interesting differences: people on the east bank of the river ate much less bread, beef, Irish potatoes, and white sugar than those on the west bank. This might have been due to their greater distance from the center of trade and citylike living in Sete Lagoas, or to the higher cost of these items because of this distance. The people tried to make up for this lack of white sugar by using much more raw sugar, usually homemade, and for the lack of beef by eating more pork, usually home raised.

Endemic goiter, common among the families in all three groups, has been known to exist in Minas Gerais for many generations and has been studied by various authors (9,11,12). Viana also studied the soils and the foods grown in these soils, and found their iodine content very low (13). Iodine deficiency was probably the main cause of goiter in this area.

### Summary, Conclusions, and Recommendations

Fifty-four rural families composed of 419 persons in the County of Jequitibá in the State of Minas Gerais in east central Brazil were studied between July 1957 and March 1958 in a

pilot nutritional survey. These 54 families were divided into 3 groups of 18 families each; group 1 consisted of farmers who were receiving technical and financial assistance from ACAR; group 2 farmers got technical but no financial help from ACAR; and group 3 farmers had never received technical or financial assistance. Families in group 1 were superior to those in the other two groups in regard to income, some conditions in their homes (stoves, privies, water filters), planting of vegetables and fruits, and year-round consumption of such foods as milk and beef. Correspondingly, they showed a lower incidence of dryness of the skin (xerosis) in July 1957 than the other two groups.

Since the families in group 1 had been exposed to the educational influence of ACAR technicians for some years, their better situation might be ascribed to this influence. Families in group 2 had been exposed much less to ACAR influence because of much more casual contact with its workers, and families in group 3 had never had contact with ACAR personnel.

Information obtained on their home environment showed the great need for a program of health education for these families. This need is still more accentuated if the high prevalence of intestinal parasites is considered. These infestations will vanish only if there is an intensive campaign of construction of privies; of instruction on washing the hands after a bowel movement, before preparing foods, and before eating; and, finally, of instruction on wearing shoes outside the home. To control schistosomiasis in group 3, the use of water infested with the carrier snail should be prohibited for bathing or washing clothing.

Information on attitudes and taboos in relation to foods points out a serious problem, not confined to this area. The mother, after giving birth, restricts her diet to a few foods instead of eating a greater variety of foods. This happens at the time when the milk that should nourish the new infant is formed. It will not be easy to overcome these taboos because they have existed for many generations. Before an intelligent and effective method to combat them can be found, we need to understand their origin.

The food consumption of these families

showed disharmony in the proportions of the various foods, a situation which is common not only in many areas in Brazil but also in other countries. The diet of these families consisted of an abundance of concentrated carbohydrates, such as rice, manioc meal, macaroni, and sugar, in addition to some meat and dried beans, the principal sources of proteins. There was a lack of vegetables and fruits in general, even though their intake increased from one season to the other.

Clinical examinations in conjunction with the dietary findings can demonstrate clearly to these people that their health will improve with more milk, fruits, and vegetables at the end of summer (March) because of a greater intake of such essential nutrients as calcium and vitamins A and C. Such demonstrations can motivate them to plant more vegetables for their own use during the entire year and to preserve food to be eaten during the winter. They also should learn to use more milk at home, selling less.

In the course of a survey such as this, it becomes obvious that one cannot really separate the conditions of personal hygiene, sanitation, and nutrition because they all influence the level of health. Thus, any program of education executed by ACAR or a similar organization should include these three basic fields. It is also clear that before planning an educational program, a survey should be made. People will respond to such a program only if it is based on their own specific needs.

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# Signs

and

# Symptoms

## of trends in public health

Since 1957, the Russian scientific translation program of the Public Health Service has made available to American scientists complete texts of approximately 5,000 Russian scientific papers, totaling 25,000 pages, and about 13,200 abstracts of such papers. In 1959, 2,300 papers from 84 issues of the 9 leading Russian journals appeared in cover-to-cover translations.

“ ”

Public health aspects of cancer control are reviewed by Norway's Dr. Karl Evang, director-general of health services, and Dr. Einar Pederson, director of the cancer registry, in the February 1960 issue of the *Journal of Chronic Diseases*.

“ ”

In Ohio, the Academy of Medicine in Toledo and health officials organized a community uterine cancer detection program for the entire female population of Lucas County.

More than 110,000 pelvic and cytologic examinations have been made on 47,000 patients. Histologically proved uterine cancer was detected in 430 patients, 275 had clinically suspected cancers, and 155 had clinically occult neoplasms detected primarily by smears.

“ ”

Logan County, Ohio, through its health department, gives each new mother a form for maintaining her child's complete immunization record. Called "Notification of Birth Registration," the form, when completed, serves to establish the child's immunization status as well as supplying proof of age for school entrance.

Prescriptions for drugs required by its members will be filled at cost by the National Epilepsy League.

“ ”

Almost 950 persons a month were killed by fire in the United States during 1959, the National Fire Protection Association reports. More than 30 percent of the casualties were children, and more than one-half the estimated total of 11,300 deaths occurred in home fires.

“ ”

Pennsylvania is making an effort to keep Australian kangaroo meat out of bologna and other foods for human use. The attorney general claims there is evidence that 1,000 tons of "unfit" kangaroo meat has been shipped into the State, and a 2½-ton import is under embargo in Philadelphia. Kangaroo meat does not come under the U.S. Department of Agriculture Meat Inspection Act. Pennsylvania claims the meat is not inspected, properly cleaned, or refrigerated in Australia, and is not identified as kangaroo meat on the label.

“ ”

Nursing research is discussed in the *Journal of the American Medical Association*, May 7, 1960, by Mrs. Apollonia O. Adams, chief of the Division of Nursing Resources, Public Health Service.

“ ”

Smallpox cases dropped by more than two-thirds throughout the world, excluding Communist China, during 1959, the World Health Organization reports. About 72,000 cases were reported in 1959, compared with approximately 242,000 cases in 1958.

Harvard will receive \$100,000 a year for the next 10 years toward expansion of nutritional research laboratories at its School of Public Health, under a grant from General Foods Corporation.

“ ”

Intellectual differences between whites and Negroes are caused by continuing socioeconomic influences and are not innate racial characteristics, Ohio State University's Dr. Hilda Knobloch, associate professor of pediatrics, and Dr. Benjamin Pasamanick, professor of psychiatry, stated at the Chicago convention of the American Orthopsychiatric Association. They said, "The dichotomy between the white and nonwhite children occurs particularly in adaptive and language behavior, those areas of behavior most subject to sociocultural influences, while motor behavior, which is more a reflection of neurological status, is essentially unchanged."

“ ”

Almost 400 million man-days a year are lost to acute upper respiratory infections. There are 142 million acute cases per annum, according to the U.S. National Health Survey, Public Health Service.

“ ”

The "Citizen Apprenticeship Program" of the AFL-CIO is described as "an adventure in community understanding," designed to encourage high school students to extend their knowledge and participation in the social services of their community.

A pilot program was tested over a 2-year period among six high schools in western Pennsylvania's Shenango Valley. During 1958 and 1959, two groups of 32 high school juniors gave eight Saturday afternoons, three evenings, and a day and one-half of their spring vacation, to observe and discuss local community health, welfare, and recreation services.

A limited number of manuals and other program materials used in the Shenango Valley project was available on a "first come" basis from AFL-CIO Community Service Activities, 9 East 40th Street, New York 16, N.Y.

# Death Rates for Coronary Heart Disease in Metropolitan and Other Areas

PHILIP E. ENTERLINE, Ph.D., ARTHUR E. RIKLI, M.D., HERBERT I. SAUER, B.A.,  
and MERTON HYMAN, M.A.

IN 1957 special tabulations of deaths and population were prepared which made possible the computation of death rates for the years 1949-51 by cause, age, sex, race, and county of residence. This paper is a report of death rates for coronary heart disease and for all causes of death in those groupings of counties which made up metropolitan and nonmetropolitan areas of the United States in 1950. (The term "coronary heart disease" is used synonymously with the International List term "arteriosclerotic heart disease.")

Death rates will be shown separately for each of 163 metropolitan areas and for the nonmetropolitan segments of 119 economic subregions. In the 1950 census, a metropolitan area was defined as a county or a group of counties containing at least one city of 50,000 or more persons plus contiguous counties, if essentially metropolitan in character and if socially and economically integrated with the central city. These contiguous counties may be considered as suburban counties. Also in 1950, 119 economic subregions of the United States were identified. These subregions, containing both metropolitan and nonmetropolitan counties and defined without regard to State boundaries, consisted of groups of counties manifesting fairly homogeneous characteristics as to patterns of gaining a livelihood, living conditions, and social and

economic problems (1,2). The economic subregion has been suggested as a useful unit for the study of geographic differences in mortality (3).

Death rates shown here were based upon tabulations prepared by the Biometrics Branch of the National Institutes of Health and the Air Pollution Medical Program from records compiled by the National Office of Vital Statistics. This work is described fully in a publication by the Air Pollution Medical Program (4). Death rates are averages for the years 1949-51; they are based upon a 50 percent random sample of deaths from heart disease (ISC 410-443) and strokes (ISC 330-334) and upon a complete count of deaths from all other causes. The population used in computing rates is for the year 1950.

Only death rates for the age group 45-64 will be shown. Observations are confined to this age group because there is some doubt as to the accuracy with which the underlying cause of death can be identified for elderly persons (5), and at ages under 45 it was felt that there were too few deaths to make their addition worth while. Deaths in the age group 45-64 are of particular interest from a public health standpoint since this is an age group with a substantial life expectancy.

In describing geographic variations in death rates, only rates for white males will be presented. This is because among females the number of deaths from coronary heart disease is relatively small, with the result that geographic variations in death rates for this cause, for the less populous geographic units, tend to lack significance in the usual statistical sense.

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*Dr. Enterline is chief, Morbidity and Health Statistics Branch, Division of Public Health Methods, Public Health Service. Dr. Rikli is chief, Heart Disease Control Branch, Division of Special Health Services; Mr. Sauer is a statistician; and Mr. Hyman is a sociologist with that branch.*

The geographic patterns in death rates for coronary heart disease for white females were found to be generally similar to those for white males in a previous study (6), however, so that the geographic patterns for death rates among males presented here probably roughly describe the patterns in death rates among females.

Because the mean age of persons in the age group 45-64 differs somewhat from one population segment to another, and because death rates are highly correlated with age, some of the geographic variation in death rates for this broad age grouping is due to variation in the age distribution of the populations under consideration. For this reason, all death rates presented in this report for the age group 45-64 have been age adjusted in 10-year intervals by the direct method to the age distribution of the total population of the United States in this age group in 1950.

#### All Areas

Table 1 shows average annual death rates for white males and females aged 45-64 for the years 1949-51 for center city and suburban counties within metropolitan areas and for non-metropolitan counties. Death rates varied directly with the degree of urbanization for both males and females. The association was greatest for coronary heart disease but appears for the "other cardiovascular diseases" grouping

and for the "all other causes" grouping. For coronary heart disease, male death rates in center city counties were 37 percent higher than in nonmetropolitan counties; female death rates in center city counties were 46 percent higher than in nonmetropolitan counties.

#### Nonmetropolitan Areas

Figure 1 shows the geographic pattern, by quartiles, in death rates for coronary heart disease for white males aged 45-64 in the non-metropolitan segments of 116 economic subregions. Three of the total 119 economic subregions have only metropolitan areas. Metropolitan areas are shown in black and are not included in the quartile distribution. Since metropolitan areas constitute only a small proportion of the total land area of the United States, variation in their death rates does not lend itself to the same kind of graphic presentation as does variation in death rates for non-metropolitan areas.

The key to figure 1 shows that death rates for the nonmetropolitan segments of economic subregions varied considerably. The subregion with the highest death rate had a rate over three times as high as the subregion with the lowest death rate. Contiguous economic subregions had similar death rates. High mortality rates were confined largely to a strip of territory near the South Atlantic coast

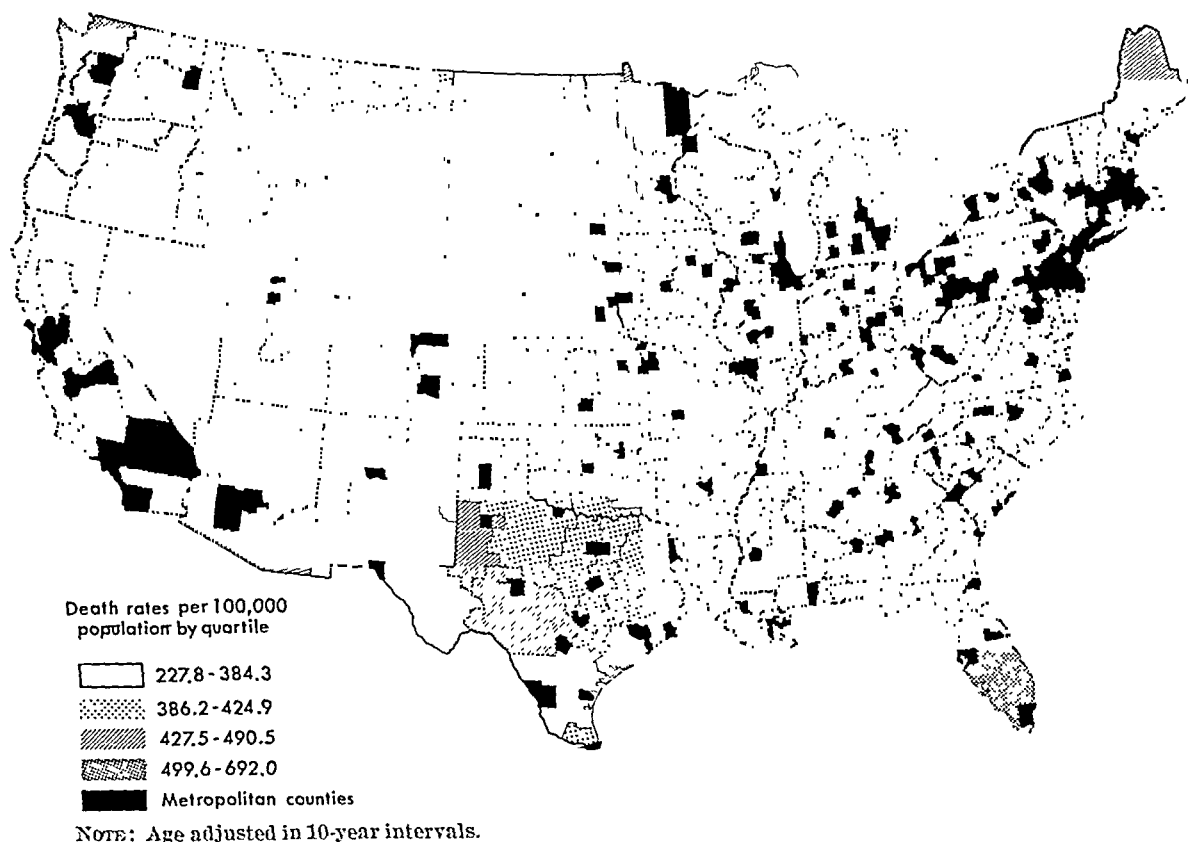
Table 1. Annual death rates per 100,000 population, by degree of urbanization, selected causes, whites aged 45-64, United States, 1949-51<sup>1</sup>

Cause of death <sup>2</sup>	Males			Females		
	Metropolitan areas		Non-metropolitan counties	Metropolitan areas		Non-metropolitan counties
	Center city counties	Suburban counties		Center city counties	Suburban counties	
All causes.....	1,730.5	1,505.3	1,374.9	943.6	894.4	786.4
Cardiovascular diseases (330-334, 400-468).....	935.3	832.2	735.7	430.9	413.1	315.0
Coronary heart disease (420).....	606.1	542.7	442.5	176.8	162.2	120.8
Other cardiovascular diseases.....	329.2	289.5	293.2	254.1	250.9	224.2
All other causes.....	795.2	673.1	639.2	512.7	481.3	411.4

<sup>1</sup> Age adjusted in 10-year intervals.

<sup>2</sup> Figures in parentheses refer to International List numbers.

**Figure 1. Coronary heart disease death rates for 116 economic subregions, nonmetropolitan areas only, white males aged 45-64, 1949-51**



stretching from Delaware to central Georgia, much of the Northeastern and Great Lakes regions, the Mississippi River Delta, and much of the area west of the Rockies. Low death rates for coronary heart disease were prevalent throughout most of the area between the Rockies and the Mississippi and in an area west of the Appalachian Mountains. Generally, the geographic pattern corresponds to that observed when, in a previous study, States were used as units for analysis (6).

Figure 2 shows the geographic pattern in death rates for nonmetropolitan areas for all causes of death for white males in the age group 45-64. Geographic variations in "all cause" death rates seem relevant to the study of coronary heart disease death rates since they probably strongly reflect geographic variations in coronary heart disease. They cannot, however, be influenced by any differences in diagnostic standards which might exist in various

sections of the country, an important consideration in studying coronary heart disease mortality. An effect of coronary heart disease on the "all cause" death rate is suggested by the fact that in 1950 over a third of all deaths among white males aged 45-64 were assigned to coronary heart disease, and if death rates for coronary heart disease truly varied they would be expected to influence death rates for all causes (7, 8).

Variations in death rates pictured in figure 2 are sufficiently like those in figure 1 to provide some assurance that geographic variations in coronary heart disease death rates similar to those shown in figure 1 truly existed around 1950 and were not simply the result of variations in diagnostic criteria.

#### Metropolitan Areas

Table 2 shows death rates for coronary heart disease and for all causes of death for white

The geographic patterns in death rates for coronary heart disease for white females were found to be generally similar to those for white males in a previous study (6), however, so that the geographic patterns for death rates among males presented here probably roughly describe the patterns in death rates among females.

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#### All Areas

Table 1 shows average annual death rates for white males and females aged 45-64 for the years 1949-51 for center city and suburban counties within metropolitan areas and for non-metropolitan counties. Death rates varied directly with the degree of urbanization for both males and females. The association was greatest for coronary heart disease but appears for the "other cardiovascular diseases" grouping

and for the "all other causes" grouping. For coronary heart disease, male death rates in center city counties were 37 percent higher than in nonmetropolitan counties; female death rates in center city counties were 46 percent higher than in nonmetropolitan counties.

#### Nonmetropolitan Areas

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The key to figure 1 shows that death rates for the nonmetropolitan segments of economic subregions varied considerably. The subregion with the highest death rate had a rate over three times as high as the subregion with the lowest death rate. Contiguous economic subregions had similar death rates. High mortality rates were confined largely to a strip of territory near the South Atlantic coast

Table 1. Annual death rates per 100,000 population, by degree of urbanization, selected causes, whites aged 45-64, United States, 1949-51<sup>1</sup>

Cause of death :	Males			Females		
	Metropolitan areas		Non-metropolitan counties	Metropolitan areas		Non-metropolitan counties
	Center city counties	Suburban counties		Center city counties	Suburban counties	
All causes.....	1,730.5	1,505.3	1,374.9	943.6	894.4	786.4
Cardiovascular diseases (330-334, 400-468).....	935.3	832.2	735.7	430.9	413.1	315.0
Coronary heart disease (420).....	606.1	542.7	442.5	176.8	162.2	120.8
Other cardiovascular diseases.....	329.2	289.5	293.2	254.1	250.9	224.2
All other causes.....	795.2	673.1	639.2	512.7	481.3	441.4

<sup>1</sup> Age adjusted in 10-year intervals.

\* Figures in parentheses refer to International List numbers.

Coronary heart disease death rates for metropolitan areas varied geographically in about the same manner as death rates shown in figure 1 for nonmetropolitan areas. There were some exceptions, however. In Florida, while coronary heart disease death rates in nonmetropolitan areas were generally high (fig. 1), rates for metropolitan areas were about average. The coronary heart disease death rate for white males aged 45-64 for the nonmetropolitan portion of the economic subregion which occupies

central and southern Florida was 550.4 per 100,000 population, while for metropolitan Orlando it was 512.9; for Tampa and St. Petersburg, 560.3; and for Miami, 646.5.

A lack of contrast between metropolitan and nonmetropolitan counties also appears in economic subregions located in Wisconsin, Illinois, and Indiana. In a few economic subregions the death rates in the nonmetropolitan portions were actually higher than in the metropolitan portions. Boston, Brockton, Fall River, and

**Table 2. Death rates per 100,000 population for coronary heart disease and for all causes, white males aged 45-64, 163 metropolitan areas, United States, 1949-51**

Metropolitan area	Coronary heart disease		All causes		Metropolitan area	Coronary heart disease		All causes	
	Rate <sup>1</sup>	Rank	Rate <sup>1</sup>	Rank		Rate <sup>1</sup>	Rank	Rate <sup>1</sup>	Rank
Akron, Ohio.....	<sup>2</sup> 491.5	132	1,436.7	133	Durham, N.C.....	541.3	101	1,501.8	115
Albany-Schenectady-Troy, N.Y.....	<sup>3</sup> 725.5	7	1,844.9	18	El Paso, Tex.....	<sup>2</sup> 441.5	148	1,789.1	24
Albuquerque, N. Mex.....	<sup>2</sup> 389.1	157	1,510.5	111	Erie, Pa.....	594.5	56	1,754.1	30
Allentown-Bethlehem-Easton, Pa.....	588.6	61	1,560.8	98	Evansville, Ind.....	547.5	96	1,647.7	68
Altoona, Pa.....	601.6	50	1,640.7	72	Fall River-New Bedford, Mass.....	<sup>3</sup> 626.5	26	1,729.4	36
Amarillo, Tex.....	483.7	136	1,564.1	93	Flint, Mich.....	601.7	49	1,527.0	108
Asheville, N.C.....	486.1	134	1,431.8	135	Fort Wayne, Ind.....	571.0	76	1,497.3	118
Atlanta, Ga.....	570.1	77	1,646.8	70	Fort Worth, Tex.....	630.9	25	1,552.9	101
Atlantic City, N.J.....	578.6	68	1,728.1	37	Fresno, Calif.....	507.5	123	1,702.5	44
Augusta, Ga.....	693.2	13	1,991.0	8	Gadsden, Ala.....	<sup>2</sup> 349.8	162	1,473.0	127
Austin, Tex.....	475.7	140	1,424.6	137	Galveston, Tex.....	<sup>3</sup> 802.1	3	1,981.5	9
Baltimore, Md.....	<sup>3</sup> 598.1	54	1,864.4	16	Grand Rapids, Mich.....	571.0	75	1,439.6	132
Baton Rouge, La.....	<sup>3</sup> 720.6	8	1,681.2	55	Green Bay, Wis.....	<sup>2</sup> 400.7	155	1,251.1	159
Bay City, Mich.....	<sup>2</sup> 438.3	150	1,686.7	53	Greensboro-High Point, N.C.....	521.6	113	1,412.9	139
Beaumont-Port Arthur, Tex.....	553.0	93	1,638.2	73	Greenville, S.C.....	<sup>3</sup> 692.2	14	1,848.7	17
Binghamton, N.Y.....	612.8	36	1,600.6	83	Hamilton-Middletown, Ohio.....	568.2	79	1,560.9	97
Birmingham, Ala.....	517.6	117	1,676.8	56	Harrisburg, Pa.....	607.8	39	1,594.1	84
Boston, Mass.....	<sup>3</sup> 606.0	42	1,690.4	50	Hartford, Conn.....	573.3	73	1,548.5	103
Bridgeport, Conn.....	<sup>3</sup> 618.3	30	1,573.6	90	Houston, Tex.....	521.1	114	1,694.9	45
Brockton, Mass.....	553.2	92	1,476.0	124	Huntington, W. Va.-Ashland, Ky.....	<sup>2</sup> 433.5	151	1,523.6	109
Buffalo, N.Y.....	<sup>3</sup> 612.9	35	1,808.4	20	Indianapolis, Ind.....	615.8	33	1,738.2	35
Canton, Ohio.....	<sup>2</sup> 472.3	141	1,431.3	136	Jackson, Mich.....	493.4	131	1,486.1	120
Cedar Rapids, Iowa.....	468.4	142	1,307.5	156	Jackson, Miss.....	634.4	22	1,769.5	26
Charleston, S.C.....	<sup>3</sup> 825.6	2	2,254.2	1	Jacksonville, Fla.....	579.9	65	1,754.0	31
Charleston, W. Va.....	592.0	59	1,761.7	28	Johnstown, Pa.....	527.6	110	1,657.9	62
Charlotte, N.C.....	<sup>3</sup> 696.6	12	1,554.6	100	Kalamazoo, Mich.....	576.7	69	1,378.8	150
Chattanooga, Tenn.....	576.7	70	1,702.8	43	Kansas City, Mo.....	564.1	85	1,610.0	82
Chicago, Ill.....	574.4	72	1,868.4	15	Kenosha, Wis.....	537.3	104	1,450.7	131
Cincinnati, Ohio.....	574.5	71	1,750.1	33	Knoxville, Tenn.....	<sup>2</sup> 460.8	145	1,570.0	92
Cleveland, Ohio.....	<sup>3</sup> 625.6	29	1,747.4	34	Lancaster, Pa.....	<sup>2</sup> 438.7	149	1,370.4	151
Columbia, S.C.....	602.2	48	1,727.0	38	Lansing, Mich.....	598.5	53	1,401.8	143
Columbus, Ga.....	603.4	46	1,913.4	12	Laredo, Tex.....	405.5	154	1,979.4	10
Columbus, Ohio.....	528.5	109	1,562.2	96	Lexington, Ky.....	<sup>2</sup> 364.9	159	1,389.0	146
Corpus Christi, Tex.....	563.6	86	1,617.6	79	Lima, Ohio.....	483.8	135	1,393.7	145
Dallas, Tex.....	<sup>3</sup> 633.2	23	1,562.5	95	Lincoln, Nebr.....	<sup>2</sup> 299.0	163	1,135.4	163
Davenport, Iowa-Rock Island-Moline, Ill.....	569.1	78	1,419.7	138	Little Rock-North Little Rock, Ark.....	611.2	37	1,622.1	78
Dayton, Ohio.....	605.6	44	1,477.9	123	Lorain-Elyria, Ohio.....	534.4	106	1,647.7	67
Decatur, Ill.....	517.5	97	1,473.8	125	Los Angeles, Calif.....	<sup>3</sup> 679.1	15	1,684.2	54
Denver, Colo.....	527.0	111	1,563.5	94	Louisville, Ky.....	551.7	94	1,689.4	51
Des Moines, Iowa.....	514.4	119	1,501.7	116	Lubbock, Tex.....	<sup>2</sup> 399.6	156	1,211.4	161
Detroit, Mich.....	563.4	87	1,661.2	61	Macon, Ga.....	564.4	83	1,995.5	7
Duluth, Minn.-Superior, Wis.....	578.8	67	1,508.9	112	Madison, Wis.....	<sup>2</sup> 458.1	146	1,315.8	153

Footnotes at end of table.

(Continued on p. 764)

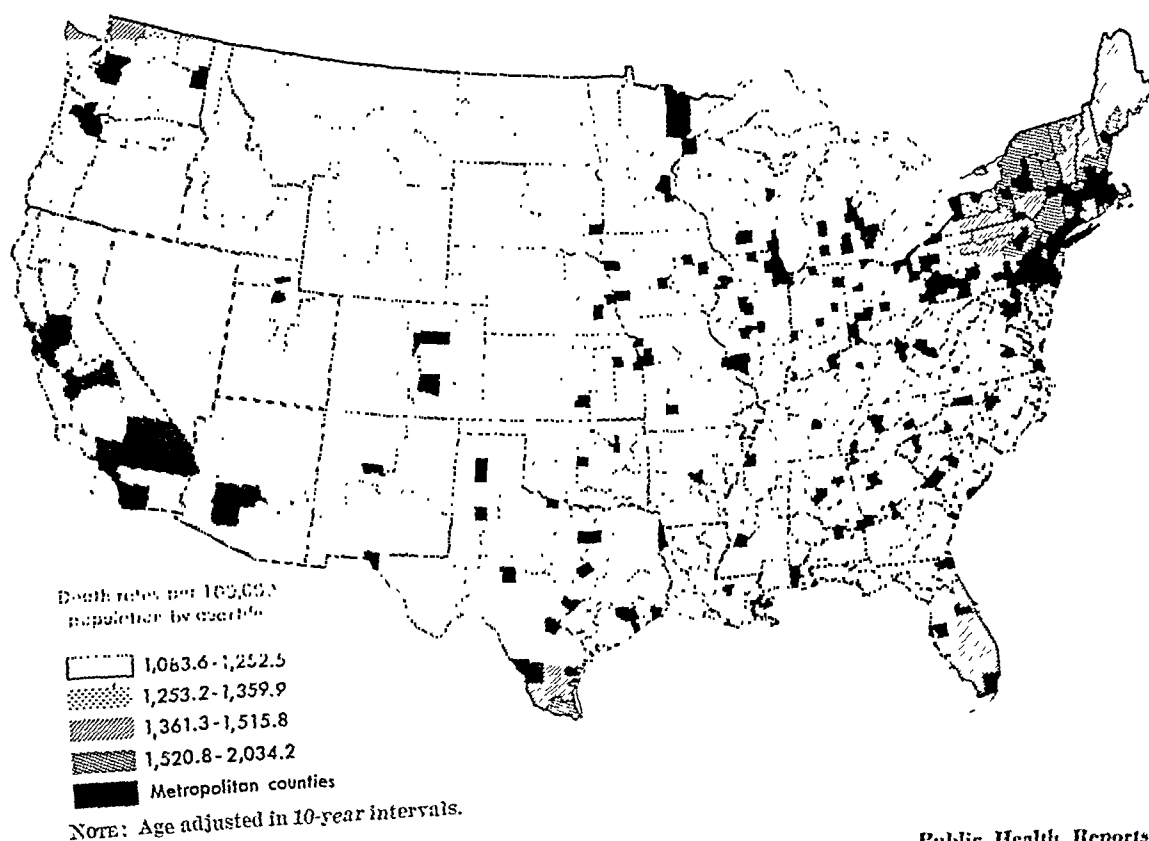
males aged 45-64 for each of the 163 metropolitan areas in the United States, and the rank of each metropolitan area in relation to all other metropolitan areas. Thus, a rank of 140 means that 139 areas had higher death rates, while 23 had lower death rates. A rank of 7 means that only 6 areas had higher death rates and 156 had lower death rates.

In Bureau of the Census publications, 168 standard metropolitan areas are used. In this report, in order to define metropolitan areas as groupings of counties, it was necessary in New England to combine certain metropolitan areas as defined by the Bureau of the Census. Also, the New York-Newark-Jersey City standard metropolitan area was divided into two areas, New York and Newark-Jersey City. For a further account of these redefinitions see the publication by Manos (4).

Metropolitan areas with coronary heart disease death rates which differed significantly

from the unweighted mean for all metropolitan areas ( $P < .05$ ) are noted, to assist the reader in determining whether a particular city in which he may be interested had an unusual death rate. Coronary heart disease death rates for metropolitan areas varied considerably, ranging from 826.8 in Savannah, Ga., to 299.0 in Lincoln, Nebr. Contrasts were great even for metropolitan areas in fairly close proximity. In Pennsylvania, for example, the death rate among middle-aged white males in Harrisburg was 607.8 while in Lancaster it was only 438.7. The corresponding "all cause" death rates in Harrisburg and Lancaster were 1,594.1 and 1,370.4, respectively. In California, the coronary heart disease death rate was 730.6 in Sacramento and 467.6 in San Bernardino; in Washington, 615.8 in Seattle and 461.6 in Spokane; in South Carolina, 825.6 in Charleston and 602.2 in Columbia; in Alabama, 517.6 in Birmingham and 349.8 in Gadsden.

Figure 2. Death rates for all causes for 116 economic subregions, nonmetropolitan areas only, white males aged 45-64, 1949-51



tend to rank correspondingly high or low in their "all cause" death rate; the rank order correlation coefficient is 0.60.

## Discussion

Relatively high death rates in urban areas were among the earliest of demographic observations. The reasons for this for noninfectious diseases such as coronary heart disease are not clearly known. Some of the urban-rural differentials in mortality previously reported may have been due to errors in the residence classification of death certificates. However, such errors are probably not an important factor in differences in death rates between metropolitan and nonmetropolitan areas. It is believed that any errors in residence classification probably take place mainly between urban and rural parts of metropolitan areas rather than between metropolitan and nonmetropolitan areas (9). Nor does it seem likely that contrasts in death rates for coronary heart disease between metropolitan and nonmetropolitan areas are due solely to variations in diagnostic criteria, in view of the contrasts observed in death rates for all causes.

Possibly even more significant than the association of coronary heart disease mortality with urbanization are the geographic differentials in death rates which cannot be accounted for by urbanization. These may be due to artifacts such as under- or over-enumeration of population, under-registration of deaths, or misstatement of age either in the 1950 census or on death certificates; or they may be the result of differentials in factors which cause coronary heart disease.

It might be productive to study metropolitan areas in relation to the mortality data presented here. Metropolitan areas seem to be particularly appropriate units for study since they constitute natural ecologic units, basically similar while relatively independent. There may also be natural units within some of the larger metropolitan areas which would form a useful basis for analysis (10).

Nonmetropolitan areas, as defined in this report, might also prove to be productive units for analysis. A previous study of variations in mortality for all causes of death among rural

counties in the United States suggested that the percentage of the population employed in agriculture explained much of the variation, particularly at ages over 40 (11). Occupational variables might be importantly involved in geographic distributions of mortality from coronary heart disease presented here, not only among nonmetropolitan areas but among metropolitan areas as well; or possibly some climatic or geological factors are involved. There are, in fact, many hypotheses relating to etiological factors in coronary heart disease which might be profitably tested by a study of factors associated with mortality rates in various segments of our population (12).

## Summary

In the United States during the years 1949-51 the resident death rates for coronary heart disease among white persons aged 45-64 varied directly with the degree of urbanization for both males and females. In metropolitan counties with center cities, coronary heart disease death rates were 37 percent higher for males and 46 percent higher for females than in nonmetropolitan counties.

Coronary heart disease death rates in the nonmetropolitan segments of 116 economic subregions varied considerably, with the highest rate being over three times the lowest. High mortality areas were confined largely to a strip of territory near the South Atlantic coast stretching from Delaware to central Georgia, much of the northeastern and Great Lakes regions, the Mississippi River Delta region, and much of the area west of the Rockies. There was a similar geographic pattern in death rates for all causes.

Death rates for coronary heart disease for 163 metropolitan areas of the country also varied considerably and followed much the same geographic pattern as death rates for nonmetropolitan areas. In a few sections of the country there was, however, little difference in coronary heart disease death rates between metropolitan and nonmetropolitan areas.

Contrasts in death rates for coronary heart disease among metropolitan areas were found to be great for some metropolitan areas in fairly close proximity.

A parallel between death rates for coronary



Table 2. Death rates per 100,000 population for coronary heart disease and for all causes, white males aged 45-64, 163 metropolitan areas, United States, 1949-51—Continued

Metropolitan area	Coronary heart disease		All causes		Metropolitan area	Coronary heart disease		All causes	
	Rate <sup>1</sup>	Rank	Rate <sup>1</sup>	Rank		Rate <sup>1</sup>	Rank	Rate <sup>1</sup>	Rank
Manchester, N.H.	602.8	47	1,670.4	57	San Bernardino, Calif.	<sup>2</sup> 467.6	143	1,483.6	121
Memphis, Tenn.	584.1	63	1,766.9	27	San Diego, Calif.	572.7	74	1,612.2	81
Miami, Fla.	<sup>3</sup> 646.5	20	1,647.9	66	San Francisco-Oakland, Calif.	<sup>3</sup> 639.4	21	1,802.1	21
Milwaukee, Wis.	<sup>3</sup> 604.3	45	1,633.1	74	San Jose, Calif.	605.6	43	1,506.6	113
Minneapolis-St. Paul, Minn.	537.2	105	1,458.2	129	Savannah, Ga.	<sup>3</sup> 826.8	1	2,080.8	6
Mobile, Ala.	599.9	51	1,631.9	75	Scranton, Pa.	586.0	62	2,085.0	5
Montgomery, Ala.	707.3	9	1,883.5	14	Seattle, Wash.	<sup>3</sup> 615.8	32	1,689.0	52
Muncie, Ind.	665.3	17	1,517.3	110	Shreveport, La.	599.1	52	1,542.7	101
Nashville, Tenn.	<sup>2</sup> 477.4	139	1,623.3	76	Sioux City, Iowa	626.3	27	1,652.2	64
Newark-Jersey City, N.J.	564.2	84	1,717.5	40	Sioux Falls, S. Dak.	558.8	91	1,385.8	148
New Haven, Conn.	568.1	80	1,649.9	65	South Bend, Ind.	563.0	88	1,461.8	128
New Orleans, La.	<sup>3</sup> 747.4	5	2,099.7	4	Spokane, Wash.	<sup>2</sup> 461.6	144	1,478.2	122
New York, N.Y.	<sup>3</sup> 677.4	16	1,751.6	32	Springfield, Ill.	632.3	24	1,780.6	25
Norfolk-Portsmouth, Va.	<sup>3</sup> 753.7	4	1,795.1	23	Springfield, Mo.	539.9	102	1,431.8	134
Ogden, Utah.	504.2	126	1,311.6	155	Springfield, Ohio	662.5	18	1,582.8	87
Oklahoma City, Okla.	516.7	118	1,578.1	88	Springfield-Holyoke, Mass.	606.1	41	1,589.8	85
Omaha, Nebr.	566.7	81	1,502.9	114	Stockton, Calif.	617.8	31	1,979.0	11
Orlando, Fla.	512.9	120	1,622.7	77	Syracuse, N.Y.	610.3	38	1,644.5	71
Peoria, Ill.	518.4	115	1,533.3	107	Tacoma, Wash.	506.6	124	1,408.2	141
Philadelphia, Pa.	<sup>3</sup> 613.9	34	1,801.1	22	Tampa-St. Petersburg, Fla.	560.3	89	1,666.4	60
Phoenix, Ariz.	<sup>2</sup> 422.7	153	1,904.3	13	Terre Haute, Ind.	531.1	108	1,751.8	29
Pittsburgh, Pa.	<sup>3</sup> 595.5	55	1,693.5	47	Toledo, Ohio.	580.3	64	1,691.0	48
Pittsfield, Mass.	559.2	90	1,647.0	69	Topeka, Kans.	493.4	130	1,258.3	158
Portland, Maine.	<sup>3</sup> 699.5	11	1,693.9	46	Trenton, N.J.	579.1	66	1,706.7	42
Portland, Oreg.	538.0	103	1,537.1	106	Tulsa, Okla.	550.9	95	1,572.2	91
Providence, R.I.	593.2	58	1,666.5	59	Utica-Rome, N.Y.	546.8	99	1,588.6	86
Pueblo, Colo.	<sup>2</sup> 357.5	161	1,217.9	160	Waco, Tex.	<sup>2</sup> 372.7	158	1,306.5	157
Racine, Wisc.	518.2	116	1,380.7	149	Washington, D.C.	<sup>3</sup> 607.7	40	1,690.9	49
Raleigh, N.C.	626.2	28	1,667.7	58	Waterloo, Iowa	480.7	138	1,388.9	117
Reading, Pa.	522.7	112	1,560.8	99	Wheeling, W. Va.-Steubenville, Ohio.	512.1	122	1,614.8	80
Richmond, Va.	<sup>3</sup> 706.5	10	1,843.5	19	Wichita, Kans.	543.1	100	1,495.2	119
Roanoke, Va.	512.7	121	1,408.6	140	Wichita Falls, Tex.	446.6	147	1,203.8	162
Rochester, N.Y.	<sup>3</sup> 652.2	19	1,540.3	105	Wilkes-Barre-Hazleton, Pa.	593.7	57	2,225.0	2
Rockford, Ill.	503.9	127	1,399.8	144	Wilmington, Del.	590.1	60	1,653.8	63
Sacramento, Calif.	<sup>3</sup> 730.6	6	2,150.2	3	Winston-Salem, N.C.	547.0	98	1,549.1	102
Saginaw, Mich.	506.6	125	1,450.8	130	Worcester, Mass.	533.0	107	1,473.3	126
St. Joseph, Mo.	482.8	137	1,402.3	142	York, Pa.	499.5	128	1,356.6	152
St. Louis, Mo.	<sup>2</sup> 498.3	129	1,711.9	41	Youngstown, Ohio.	565.6	82	1,575.4	89
Salt Lake City, Utah.	491.0	133	1,500.4	117					
San Angelo, Tex.	<sup>2</sup> 357.8	160	1,315.6	154					
San Antonio, Tex.	<sup>2</sup> 429.9	152	1,723.7	39					

<sup>1</sup> Age adjusted in 10-year intervals. <sup>2</sup> Significantly below average at 0.05 level. <sup>3</sup> Significantly above average at 0.05 level.

New Bedford, Mass., and Providence, R. I., all have lower death rates than the nonmetropolitan portion of the economic subregion they occupy. In Texas, the Lubbock metropolitan area had a coronary heart disease death rate for white males 45-64 of 399.6 while the corresponding death rate for the nonmetropolitan portion of the economic subregion it occupies was 472.7; San Angelo had a rate of 357.8 while in the remainder of the economic subregion it occupies the rate was 427.5; Pueblo,

Colo., had a death rate of 357.5 as compared with 360.7 for the remainder of its subregion; and Albuquerque, N. Mex., had a death rate of 389.1 compared with 401.8 for the remainder of its subregion.

As was true for nonmetropolitan segments of economic subregions shown on figures 1 and 2, there is a correlation between death rates for coronary heart disease and death rates for "all causes." Metropolitan areas ranking high or low in their coronary heart disease death rate

*Philadelphia's program in the control of accidental poisonings delineates possible guidelines for other metropolitan areas with similar resources and interest. The National Clearinghouse for Poison Control Centers serves as a consulting and coordinating agency for such programs throughout the country.*

## Control of Accidental Poisoning in Philadelphia

EMIL A. TIBONI, B.A., M.P.H.

**T**HE TELEPHONE rang at the Philadelphia Poison Information Center. The man on duty lifted the receiver. A woman on the line pleaded tearfully, "My baby has just swallowed a mouthful of paint remover! What should I do?"

Swiftly, the duty officer determined exactly what had been taken and the amount; the age, sex, and weight of the victim; and the necessary information to permit followup of the case. All the facts were recorded on an especially designed form which served as both a checklist and a record. The card file and the selected texts of the extensive reference library containing definite information on more than 20,000 products were consulted.

The mother was then given instructions. "Have your child sip ice-cold orange juice or ice water to prevent vomiting and delay absorption. He should have medical attention immediately. Don't be alarmed but take him to your nearest hospital right away. Do you have transportation? Your husband has the car? Then get ready to leave and we will have a police car pick you up right away. What hos-

pital will you go to? We will call to say that you are coming in. The police car will be at your home right away."

A call to the police department dispatcher sent a car to call for the mother and child. Another call was put to the emergency ward of the hospital to give notice of the case coming in and the physician in charge was given information on the composition of the product and treatment recommended in data at the center. The hospital's special treatment facilities, necessary medicinals, and supplies made preparations possible before the arrival of the child. Prompt treatment was given and the child recovered completely.

This case represents the services performed every day by the Poison Information Center in Philadelphia. The center is an important and dramatic service designed to assist the medical and lay members of the community to make maximum use of the precious minutes which lie between the occurrence of the poisoning accident and the beginning of the poisoning injury. Rapidity and severity of injury vary according to the substance ingested and other factors, but in most accidents, there is some time which can be used to prevent or reduce injury or save a life.

In more difficult cases, the center calls for the

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*Mr. Tiboni is chief, community hygiene section, division of environmental health, Department of Public Health, Philadelphia, Pa.*

heart disease and death rates for all causes suggests that the variations in coronary heart disease death rates noted here were probably not simply the result of differences in diagnostic criteria in various sections of the country.

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### *Report to the People*

In the 1959 report of the health department of Peoria, Ill., printed in pocket size on coated paper, the frontispiece carries a sketch of the new city health center. An informal greeting, of 250 words, by Dr. Fred P. Long, director of health, is followed by eight pages of pictures of the department in action, including press and television work, classes for expectant parents, inservice training, counseling by public health nurses of mothers and the aged, school health, followup of accidental poisoning, clinics, history recording and filing, sanitation, laboratory and dental services, rabies control, and a deep bow to the clerical staff restoring their mental health over a cup of coffee.

One page with six brief paragraphs is given to current achievements, such as a conference on emotional health in the schools and the

reduction of the number of outside toilets to 26 in a community which had 3,300 when the health department was organized. The facing page looks to the future, with three items, set up in news-page form, referring to an air pollution report, a survey of the effects of fluoridation in the city, and a continuing program of immunization.

The last page carries the local vital statistics, with a breakdown of leading factors in death and illness, and a financial statement. The inside back cover lists the names, jobs, and locations of all employees of the department. The back cover says: "Scientific progress is based on the art of knowing the changing wants and needs of the people."

George Hensley, director of health education, lists himself in alphabetical order under administration.

hospitals. Preventive measures include follow-up of each reported case, statistical and epidemiological analysis, education, consultation, and proposed legislation. The potential for research into effects of certain substances and the management of selected cases is inherent in the program but no specific projects are currently underway. Such research is already an important function of the National Clearinghouse for Poison Control Centers, Public Health Service, to which statistical data from the Philadelphia program are provided.

### Minimization of Consequences

In recognition of the existing and expected occurrence of numerous cases of accidental poisoning, considerable effort has been expended in the development of facilities to minimize the consequences of these accidents.

The term "accidental poisoning" as used in

this program does not imply the evaluation of substances involved, with the establishment of some minimum level of toxicity before the substance is included. The term signifies the ingestion of a nonedible substance or the inhalation or other exposure to a substance which is believed to present some toxic hazard.

The Poison Information Center was the first operative part of the program because of this apparent need. In addition, it was recognized that the emergency information service would be a dramatic concrete activity through which attention could be focused on poisoning hazards. A further consideration was that cooperation in reporting of cases by hospitals would be enhanced by first providing them with such a service.

The Poison Information Center is at present located in the office of the medical examiner, a branch of the department of public health. It is under the technical supervision of the chief toxicologist. Information is given in emergencies on a 24-hour-a-day basis to anyone who telephones. Calls, answered by investigators from the staff of the medical examiner, are received on a direct incoming telephone line equipped with a distinctive bell commanding immediate attention. The telephone number of the Poison Information Center, Walnut 2-5524, has been widely publicized. Through the cooperation of the Bell Telephone Company of Pennsylvania, this number is listed in the "emergency calls" section of the Philadelphia and other southeastern Pennsylvania telephone directories.

The center gives full information regarding toxic ingredients, symptomatology, and recommended treatment measures to physicians and hospitals. Information to lay persons is limited to first-aid measures and a suggestion for immediate referral to a hospital or family physician, according to the seriousness of the case. It is felt that information on first-aid measures can be limited in an urban community where professional attention at a hospital is available within a few minutes in any area of the city. By alerting the hospital in advance, the net time before treatment is further reduced.

Use of a standard telephone inquiry form (see form) permits uniformity in handling and

<b>REPORT OF TELEPHONE INQUIRY</b> CITY OF PHILADELPHIA DEPARTMENT OF PUBLIC HEALTH			DATE RECEIVED AT P.H.C.		
MATERIAL (Poison) INVOLVED NATURE AND AMOUNT					
NAME OF VICTIM			AGE	SEX	WEIGHT
ADDRESS			PHONE		
NAME OF CALLER			RELATIONSHIP		
ADDRESS OF CALLER			PHONE		
ACTION TAKEN BY PERSON ANSWERING PHONE, OTHER REMARKS					
DATE OF ACCIDENT		TIME OF ACCIDENT		PERSON RECEIVING INQUIRY	
REFERRAL INFORMATION (For A.P.U. Use Only)					
DATE RECD FROM P.H.C.	DATE REF. TO H.D.		REFERRED TO HEALTH DISTRICT		
PERSON			REFERRED BY		

services of one or more of the volunteer members of five panels of consultants or the chief toxicologist of the office of the medical examiner. When information on composition of a product is not available in the community, a call is placed to the manufacturer for discussion with the company toxicologist or other appropriate person.

Poison control is an integral part of the accident control program of the Philadelphia Department of Public Health. Within this framework, accidental poisonings are regarded as simply another type of accident to be controlled by all available means.

Control of accidents is conducted comprehensively in the department's program as well as in depth. Ideally, the objective is to prevent the occurrence of the accident. Primary concern, however, is to prevent or minimize possible injury, if an accident does occur. The need for rehabilitation of persons sustaining accidental injuries is also recognized. All of these stages of control are the concern of the department.

To meet these needs, an extensive interdisciplinary public health and community effort has been developed over the past several years. Responsibility for the planning, development, and direction of poison control rests with the accident control program which is centered in the community hygiene section of the division of environmental health. Poison control functions are conducted by various divisions of the department having necessary resources, through agreement reached between the respective divisions and the director of the accident control program. For example: A coordinating committee composed of heads of the cooperating divisions reviews special questions or problems encountered in the operation of poison control activities. Personnel and other resources contributed by the respective divisions are provided presently through use of funds budgeted to the respective divisions. Proposals supported by the committee have requested allocation of specific funds for poison control to the accident control program which would in turn allocate necessary funds to cooperating divisions according to program needs.

Community contributions of services are received directly from individuals, hospitals, and

professional organizations, and the Greater Philadelphia Safety Council.

One of the most important community activities is the system of poison control coordinators. At the request of the poison control program director, a member of the staff of each general and children's hospital of the city was designated by the hospital administrator to work with the health department in furthering the control of accidental poisonings. Usually, the person designated is a physician having substantial responsibility in the hospital. In some cases, an upper level administrator is designated. Responsibilities of the poison control coordinators include liaison with the poison control program, staff education, supervision of reporting of cases treated at the hospital, and development of emergency treatment techniques and facilities to the maximum extent possible in their respective hospitals.

Initial impetus for the program came from the Philadelphia Pediatric Society which requested the health department to establish a poison control program and offered its assistance for this purpose. In the autumn of 1955, an advisory committee was formed to review the department's plans and to develop specific program proposals which could be supported by the entire community. In addition to several pediatricians and other specialists representing their respective societies and the five medical schools of the city, the committee included representatives of a variety of other organizations concerned with potentially poisonous substances. These included the Manufacturing Chemists Association, American Pharmaceutical Association, American Industrial Hygiene Association, Eastern Pennsylvania Pest Control Association, American Chemical Society, Philadelphia Association of Retail Druggists, and a staff representative of the Philadelphia Department of Public Health.

The program as ultimately evolved represents a balance between prevention and efforts to minimize the consequences of accidental poisoning. Relative emphasis can be expected to vary as possibilities for different types of action are developed. Actions taken locally to minimize consequences are the establishment of the poison information center and the well-developed emergency treatment facilities available in most



ferred to the local or State health department office having jurisdiction.

The public health nurse completes a "Follow-Up Investigation of Poisoning" form, and evaluates the environment and the family situation, providing advice accordingly. If indicated, the nurse will continue to assist the family. Her final report is also submitted to the accident control program where it is reviewed, coded, and collated with other reports on the case.

Currently, approximately 1,000 cases per year are being investigated. Investigations are made only when the exposure appears to have been accidental or the circumstances are not clear. Exposures involving suicidal or homicidal intent are excluded. Apparent suicide attempts are referred to the division of mental health for possible action in suicide control efforts.

Lead poisoning is regarded as a separate program activity because of the differences in

etiology and control measures involved. Cases of lead poisoning, when reported, are investigated by other personnel through a different set of procedures. Also, control measures are developed and applied separately from those of accidental poisoning.

After coding and collation, all forms received on each case are transferred by accident control personnel to the division of statistics and research where the data are recorded on machine punchcards, and tabulated periodically. Tables prepared are similar to those recommended by the National Clearinghouse for Poison Control Centers. It is hoped that continuing evaluation of the data on hand and opinions of those closely concerned with the program will provide increasing epidemiological insight through selective additional cross tabulations and possible modifications of followup reports.

Although specific data are regarded as essential to successful education, certain educational efforts have been made on the basis of

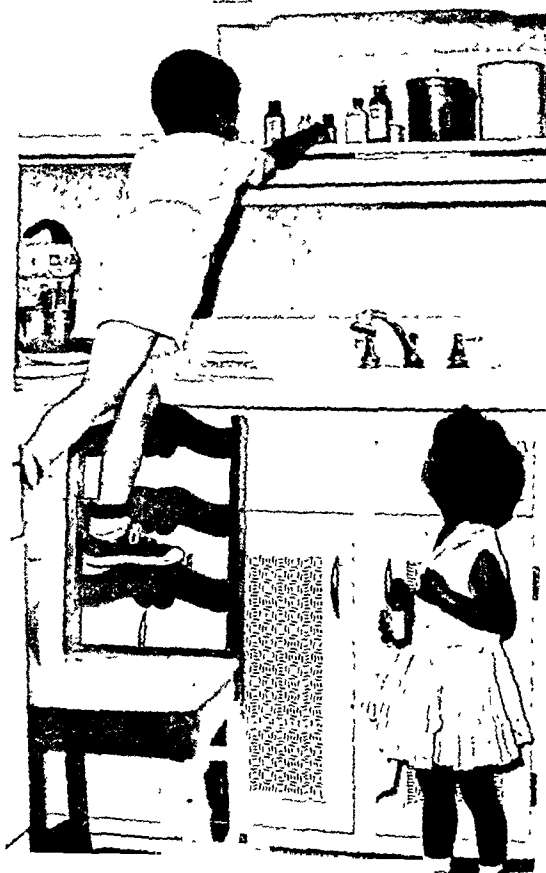
a written record of each case. This form also serves as a report to the central office.

In addition to the card file, an extensive reference library, and the services of the chief toxicologist of the office of the medical examiner, noted above, five panels of professional consultants may be called if necessary for additional guidance on therapy, composition of pharmaceuticals, household products, or pesticides and the effects produced by the bites or stings of poisonous plants and animals.

Recommendations are offered to the city hospitals by the poison control program on organization of treatment facilities, and the equipment, supplies, and medicinals, which are desirable. The emergency treatment facilities of Philadelphia General Hospital, a branch of the health department, have been fully developed with the cooperation of the hospital staff and the American College of Apothecaries. These facilities serve both as a model to other hospitals and as a source of emergency supplies and medicinals. Items required only on unusual occasions have been located and arrangements for immediate procurement at any hour have been made. This includes a complete supply of snake antivenin, which is supplied to Philadelphia General Hospital by the Philadelphia Herpetological Society or which is available through local pharmaceutical houses. All local hospitals providing emergency service have been supplied with a list of recommended items and an indication of where they may obtain them if needed in an emergency.

In the event that a hospital requires an item in an emergency, the poison information center advises where it can be obtained and arranges delivery by the police department, if necessary. The hospital is required to replace or pay for the item within a reasonable time.

Arrangements to make supplies and medicinals available on emergency loan have recently been broadened to provide this service to any community in the Nation. Commercial air carriers have volunteered to give shipments expeditious handling, and the Pennsylvania Air National Guard has offered to fly emergency missions. These requests will be handled in the same manner as requests from Philadelphia hospitals except that delivery will be made to the Philadelphia International Airport. If



schedules and the nature of the emergency permit, the required item is carried on a commercial flight. In cases of great urgency, transportation is arranged by a chartered flight or by the Air National Guard.

### Prevention

Efforts in prevention begin with a followup investigation by public health nurses of each reported case. The poison information center forwards to the accident control office a duplicate copy of the "Report of Telephone Inquiry" form. The hospitals of the city and surrounding areas complete and forward an especially designed "Report of Poisoning" form, which also gives information on the substance involved and clinical data.

Each case involving a resident of the city is immediately referred to the health district where the victim lives. An investigation is made within 5 days of the accident. Cases involving residents of other communities are re-

additional knowledge, as it is obtained, to their attention.

The cost of this program is not measured readily because its activities are almost entirely absorbed by various cooperating divisions. However, estimates based on a careful review of personnel time and materials indicate that approximately \$55,000 per year is being used.

There is ample evidence, from surveys conducted by the American Academy of Pediatrics, from morbidity data and reported cases in Philadelphia, and from other statistics, to indicate that accidental poisoning is a major problem and that it is likely to continue to increase markedly unless effective preventive measures are applied. There can be little doubt that the emergency information given to more than 2,400 persons per year who were sufficiently alarmed to call the poison information center represents an important and valuable public service. Similarly, the emergency treatment of victims of accidental poisoning undoubtedly continues to improve as a result of the continuing exchange of ideas among the poison control coordinators of the various hospitals and our staff. It also appears that injuries from accidental poisonings can be reduced more readily than injuries from most other types of accidents.

The emergency information given, improvements in emergency treatment of cases, increased attention by both physicians and the general public, substantial data gathered for analysis, and general community mobilization are all regarded as useful contributions to the community welfare.

#### **Plans for the Future**

It is hoped that the program may expand. One proposal, if accepted, would provide for an answering service 24 hours each day staffed by graduate nurses under supervision of a public health physician.

The establishment of an ad hoc committee of members of the professional community is planned to study the question of research into the toxic effects of certain substances and management and rehabilitation of cases, and to propose specific research studies.

The only major forecast is a change from

the present followup of all reported cases to a selective followup procedure, after data have been accumulated for another 2 or 3 years.

#### **Summary**

The Philadelphia Department of Public Health conducts a poison information center which provides emergency information on the composition of over 20,000 trade name products and the treatment recommended if accidentally taken. Consultation in emergency and nonemergency situations is provided by a toxicologist and five panels of consultants to the program. The telephone number has been listed in the "emergency calls" section of the telephone directories of the area, as a public service by the telephone company.

Each hospital has appointed a poison control coordinator who is responsible for liaison with the program, staff education, and supervision of reporting of cases to the health department. Well-developed special treatment facilities exist in most of the hospitals of the city and immediate suburbs. Emergency transportation of victims to hospitals is provided by the police department. An inventory of rare or unusual drugs, supplies, and equipment has been prepared. The location of these items is recorded at the poison information center and has been supplied to each hospital. Special arrangements for emergency transportation of needed items have been made with the police department. Required items will also be transported by plane to any point in the Nation through the cooperation of the commercial airlines and the Pennsylvania Air National Guard.

Public health nurses conduct a home investigation of each reported case. Data on the case, including clinical history, are provided by the hospitals. These data are analyzed and interpreted statistically and epidemiologically. Cooperation with the National Clearinghouse for Poison Control Centers is maintained.

Public and professional education is conducted through mass media, wide associations with professional and civic groups, and by specially prepared materials, including exhibits and leaflets.

**NOTE:** The author will supply, upon request, copies of the various forms and literature used in the program.



preliminary findings and empirical judgment. These efforts have been primarily promotional, to call attention to the seriousness of the problem and the resources available in an emergency.

Some public education has been accomplished by distribution of several hundred thousand copies of a leaflet entitled, "Accidental Poisoning: How To Prevent It: What To Do If It Occurs." The press, television, radio, and exhibits have been used. A limited number of talks have been given to community groups. Excellent cooperation has been received from a number of local groups, including the local chapter of the American Society of Safety Engineers, the Health and Welfare Council, Philadelphia Hospital Pharmacists Association, and local telephone officials.

Proportionately more emphasis has been given to presenting and developing the subject with various medical, nursing, and public health groups, where contacts are extensive and the program is well known. Requests for information are common.

A major effort in professional education has just been completed in the form of a full-day symposium on accidental poisoning. We hope to publish the proceedings. Those attending included the poison control coordinators and various other groups having professional or business interest in accidental poisonings, as typified by the original advisory committee.

Broader public education efforts have been delayed pending development of additional local data. While the need for even more epidemiological data is recognized, the extensive data already produced make it possible, we believe, to begin an ambitious plan of action. This plan contemplates the participation of each of the various disciplines of the department having central or health district contacts with public and professional groups.

It is recognized that certain control legislation is desirable, and data to support such legal controls are being gathered. It appears advisable, however, that legislation should be enacted by as large a political jurisdiction as possible, as long as the standards it establishes meet local needs. Design and maintenance standards in dwellings appear to be an important area for possible local legislation at this time.

## Evaluation

Evaluation of the operation of the program is a continual process conducted by the director and staff of the program with the assistance of the intradepartmental coordinating committee composed of the directors of cooperating divisions.

There is widespread and enthusiastic support in the community and an unquestioning acceptance of the hazards of accidental poisoning. This is in sharp contrast to the attitude displayed toward certain other types of accidents. Using the criterion of public acceptance, it appears that this has been a proper and adequately conducted program.

There seems to be little doubt that the poison information center should be under medical supervision. This is especially true of the actual dispensing of information. Despite the fact that it is clear to the caller that the person answering the telephone inquiry is not a physician, there is still some question of liability. In many instances a physician calls and there appears to be a desire on his part to discuss the case with the person providing the information. It appears preferable that first-aid information to parents or other lay callers be given under guidance of a physician.

Preparation of information cards and other steps to review and organize data for dispensing are now handled well at the center under supervision of a competent toxicologist, but nevertheless specific medical review and approval of each recommendation would be of considerable value.

There is a need for more intensive effort in analysis and interpretation of followup and hospital-reported data. Current statistical resources are competent but limited. In addition, there is need for continuing interpretation by personnel specifically charged with epidemiological analysis of this subject. More attention should be focused also on areas of research in the management of cases and the relative effect of a variety of substances on human beings, as opposed to empirical determinations or findings with experimental animals.

Attention by physicians and hospitals to accidental poisoning has grown steadily. Only additional time and effort is required to bring

additional knowledge, as it is obtained, to their attention.

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A major effort in professional education has just been completed in the form of a full-day symposium on accidental poisoning. We hope to publish the proceedings. Those attending included the poison control coordinators and various other groups having professional or business interest in accidental poisonings, as typified by the original advisory committee.

Broader public education efforts have been delayed pending development of additional local data. While the need for even more epidemiological data is recognized, the extensive data already produced make it possible, we believe, to begin an ambitious plan of action. This plan contemplates the participation of each of the various disciplines of the department having central or health district contacts with public and professional groups.

It is recognized that certain control legislation is desirable, and data to support such legal controls are being gathered. It appears advisable, however, that legislation should be enacted by as large a political jurisdiction as possible, as long as the standards it establishes meet local needs. Design and maintenance standards in dwellings appear to be an important area for possible local legislation at this time.

## Evaluation

Evaluation of the operation of the program is a continual process conducted by the director and staff of the program with the assistance of the intradepartmental coordinating committee composed of the directors of cooperating divisions.

There is widespread and enthusiastic support in the community and an unquestioning acceptance of the hazards of accidental poisoning. This is in sharp contrast to the attitude displayed toward certain other types of accidents. Using the criterion of public acceptance, it appears that this has been a proper and adequately conducted program.

There seems to be little doubt that the poison information center should be under medical supervision. This is especially true of the actual dispensing of information. Despite the fact that it is clear to the caller that the person answering the telephone inquiry is not a physician, there is still some question of liability. In many instances a physician calls and there appears to be a desire on his part to discuss the case with the person providing the information. It appears preferable that first-aid information to parents or other lay callers be given under guidance of a physician.

Preparation of information cards and other steps to review and organize data for dispensing are now handled well at the center under supervision of a competent toxicologist, but nevertheless specific medical review and approval of each recommendation would be of considerable value.

There is a need for more intensive effort in analysis and interpretation of followup and hospital-reported data. Current statistical resources are competent but limited. In addition, there is need for continuing interpretation by personnel specifically charged with epidemiological analysis of this subject. More attention should be focused also on areas of research in the management of cases and the relative effect of a variety of substances on human beings, as opposed to empirical determinations or findings with experimental animals.

Attention by physicians and hospitals to accidental poisoning has grown steadily. Only additional time and effort is required to bring

# The Future of Alcoholism Programs

I. JAY BRIGHTMAN, M.D.

*In the closing paper at the 10th annual meeting of the conference of the North American Association of Alcoholism Programs, held in West Harwich, Mass., September 11, 1959, Dr. Brightman appraised current programs for treating alcoholics and suggested some future trends. Following is a summary of his statement.*

A PROGRAM for alcoholism can be no stronger than the total public health, mental health, educational, and welfare programs of the community. No matter how many specialized clinics and hospital services we have, we shall still be dependent upon adequate medical and mental health clinical services in the community to accept, treat, and rehabilitate alcoholics if the total needs are to be met.

The best vocational programs of local alcoholism committees cannot serve the alcoholic as well as an adequately organized public vocational rehabilitation service which evaluates, trains, and places persons with all types of long-term illnesses and disabilities, including alcoholism.

Indeed I question whether we are justified in asking for well-organized alcoholism programs in the absence of adequate public health services. What about a community which is weak in maternal and child health and welfare services, has inadequate tuberculosis control, and lacks an approach to cancer control? Which program should have priority? Recognition of such deficiencies means that a group interested in alcoholism control has a double duty; it must first argue for the development of these more basic services.

Scientists, including Dr. E. M. Jellinek, are

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*Dr. Brightman is assistant commissioner for chronic disease services, New York State Department of Health, Albany.*

working on an improvement of the Jellinek formula for estimating the prevalence of alcoholics in the country, the State, and the community. We can look forward to the development of a more precise instrument to make comparisons, to observe trends, and to place alcoholism in perspective in relation to other public health concerns. However, our most elaborate alcoholism programs now provide for only a handful of the total number of alcoholics known to the courts, the family agencies, the welfare departments, and the waiting lists of the alcoholism clinics themselves.

## Planning for Types of Alcoholics

To a great extent, many of our programs were sold on the basis that the alcoholics were crowding our courts and jails and were disgracing our cities with skidrows. It was expected that development of public information centers and clinic services would reduce the court problem. Many clinics have developed, and most of these are taxed to capacity. I don't think many of us would claim that we have yet made a significant dent in the conditions upon which we based our premises. We have recognized that our clinics are serving a different population, the problem drinker whose alcoholism is interfering with his family, industrial, and community life, even though he may still be maintaining ties in these areas.

We must reconsider the alcoholics known to the courts and to the police. We must recognize that in these patients who are mostly homeless and have little or no social background upon which to build, nothing to which they may be rehabilitated, we have a sociological rather than a public health problem.

In New York State we have been interested

# Federal Publications

**The Membrane Filter.** *PHS Publication No. 749; 1960; 20 pages; 20 cents.*

A teaching aid to supplement the filmstrip "The Membrane Filter," this booklet provides instruction on how to use the filmstrip. It contains black and white copies of the pictures appearing in the film and the full text of the sound record which accompanies the filmstrip.

These pictures and text illustrate and describe the use of the membrane filter technique for bacteriological analysis of water. Also included is information on how to obtain loan copies of the filmstrip with sound recording and other visual aids for water supply training.

**Directory of State and Territorial Health Authorities.** *PHS Publication No. 75; revised 1960; 104 pages; 35 cents.*

Health department personnel of each State and Territory are listed so as to reflect the organizational pattern of the department. Preceding the listing of health department officials is a listing of all State and Territorial Health officers, showing the title, headquarters address, and telephone number of each health department.

Similar information is shown for State agencies other than health departments administering grant programs of the Public Health Service and the crippled children's grant program of the Children's Bureau.

**Sanitation Facilities for Indians. What does P.L. 86-121 mean to you?** *PHS Publication No. 735; 1960; 6 pages.*

Designed primarily for Indian and Alaskan Native beneficiaries of the Public Health Service and their tribal leaders, this leaflet highlights the scope of projects and the requirements for participation under the Indian Sanitation Facilities Act (P.L. 86-121, approved July 31, 1959.)

Through questions and answers, the Public Health Service's authority to assist Indians in the construction of domestic and community water supplies, waste disposal, and other sanitation facilities is explained. Emphasis is placed on the participation of Indians in all phases of project development and construction, including assumption of their responsibilities for operation and maintenance.

**Summary of NIH Research Programs in Aging, 1959.** *PHS Publication No. 740; 1960; 16 pages; 15 cents.*

Research in aging carried out or supported by the National Institutes of Health during calendar year 1959 is briefly reported.

Divided into sections on intramural and extramural activities, the booklet discusses research in three broad areas: (1) biological process of aging; (2) chronic diseases associated with the aged; and (3) additional health-related problems. Special attention is given to studies conducted by the Section on Aging, National Institute of Mental Health, and the Gerontology Branch, National Heart Institute, and lists of papers and publications by their staff members are included.

Statistical summaries of extramural research are also presented.

**Community Health Program Materials. Selected references.** *PHS Publication No. 783; 1960; 59 pages.*

More than 250 references to selected materials produced primarily by the Bureau of State Services, Public Health Service, are listed.

Intended for use by State and local health departments and voluntary health agencies, the materials include guides to organizing and administering public health programs, recommendations for standards and codes, vital and health statistics, and health information for the public.

Some of the items will be of value in training and orienting employees new to public health programs; others, in presenting new knowledge in areas receiving increasing program emphasis such as chronic diseases and health of the aged, radiological health, air and water pollution, health mobilization, and accident prevention.

**Fertility Tables for Birth Cohorts of American Women. Part I. Annual and cumulative birth rates, by age, by order of birth for all women in cohorts of 1876 to 1943. Vital Statistics—Special Reports; Selected Studies; vol. 51, No. 1; Jan. 29, 1960; by Pascal K. Whelpton and Arthur A. Campbell; pages 1-129.**

Tables of annual and cumulative birth rates present various measures of fertility for actual groups of women from their 14th to their 50th birthday. The accompanying text explains the cohort fertility concept and methodology and describes the changes in cohort birth rates. It also gives examples of uses of cohort fertility rates.

The data presented are important in interpreting short-run changes in fertility as measured by conventional period rates, in assessing the effect of these changes on cumulative fertility and family size, and in making birth projections.

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This section carries announcements of new publications prepared by the Public Health Service and of selected publications prepared with Federal support.

Unless otherwise indicated, publications for which prices are quoted are for sale by the Superintendent of Documents, U.S. Government Printing Office, Washington 25, D.C. Orders should be accompanied by cash, check, or money order and should fully identify the publication. Public Health Service publications which do not carry price quotations, as well as single sample copies of those for which prices are shown, can be obtained without charge from the Public Inquiries Branch, Office of Information, Public Health Service, Washington 25, D.C.

The Public Health Service does not supply publications other than its own.

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such training. Many are with general programs and we are hopeful that this training will increase their services to the alcoholic population.

### Evaluation of Results

In evaluating the results of our work, it is essential not to make false claims. These can set us back many years or possibly eliminate our programs entirely. On the other hand, it is equally important to recognize where improvements have occurred. Certainly, we recognize that it is not necessary for alcoholic patients to develop into complete abstainers before they can begin to show improvement. Maintenance of family relationship which has been shaky during the period of frequent drinking, ability to keep a job that was previously threatened, ability to stay out of jail when frequent police pickups have formerly occurred; these are signs of real improvement, even though ideal behavior may not have been attained. Reductions in the frequency and intensity of alcoholic bouts permit the alcoholic to function to some degree and enjoy a more sympathetic environment, which is an important element of therapy.

The halfway house and other specialized services require careful study. It is not sufficient to say so many persons were placed in employment. The question is how long do they stay in employment. Data given out on the general vocational rehabilitation programs use as a criteria a placement of a person in a job for 30 days. But how many persons who can maintain themselves in jobs for 30 days, particularly after a great deal of supportive therapy by vocational counselors and other persons and possibly special consideration by their employers, are still able to hold a job after these special considerations are dropped? As more halfway houses develop, we must begin to develop procedures for following such persons to see how many are working at 3 months,

6 months, and 1 year. We may then determine whether such results are related to our own efforts.

### The Future

The North American Association of Alcoholism Programs has grown from a handful of member agencies 9 years ago to our present 36 members. At the same time the number of commissions on alcoholism has declined from 18 to 14, and the number of State department of health alcoholism units has increased from 8 to 14. This is a healthy sign if, as I believe, alcoholism programs can be most effective when closely associated with other public health programs.

The association is fortunate to have had a joint committee with the National Council on Alcoholism. In every area of health, a proper balance of activities between public and voluntary agencies is essential to really effective action. There is not only ample room but definite need for both, and the more one progresses, the easier will be the task for the other.

We have three major goals for the years ahead; evaluation of what we have done, the development of better means of prevention, and the advancement of behavioral, biochemical, and administrative research. The association is sponsoring the development of an evaluation study through a new Coordinating Commission on Alcoholism, which has the potential of gaining confidence for our present activities, or if we are not operating in the proper direction, reshaping them.

Prevention, of course, is the ultimate goal. However, for the present there is no likelihood of prevention of alcoholism as a specific phenomenon. Prevention lies in the promotion of mental health and in assistance to emotionally immature or unstable persons. This course of action may serve to curb not only alcoholism but many other forms of destructive behavior.

in the development of an institution, Camp LaGuardia, at Chester, N.Y., where men are referred from the Municipal Lodging House in New York City. Originally designed to give these men a few weeks stay in the country, the camp is now a 1,000-bed facility with two-thirds of its residents permanent. They have demonstrated that they need sheltered care more than they do alcohol; only about 20 percent violated camp rules and went to the village for alcoholic beverages, not satisfied with the beer purchasable on the premises. By having every man take care of his personal needs and all who are capable perform chores, the camp is run at the cost of \$2 per person per day, or 10 cents less than the cost of operating the Municipal Lodging House.

Specialists may argue that nothing is being done to rehabilitate these unfortunate individuals and that it is not a "modern approach" simply to provide sheltered care. Obviously, a great number of professional services, including social work evaluations and vocational rehabilitation counseling, assuming professional personnel could be recruited, would send the costs of this operation beyond what the taxpayers and the legislators might be willing to meet. The question would arise as to what might be expected from such services. Certainly every attempt should be made to identify those campers who might have potentialities for achieving a better social and economic status in life. But our efforts might better be spent, from the financial and personnel viewpoints, in the rehabilitation of persons suffering with chronic alcoholism who have a more sound social structure upon which to build.

Public and voluntary agencies have made much headway in gaining support for alcoholism programs from certain segments of the population, but there are still many obstacles to reasonable acceptance of the program by the community as a whole.

Why is the public not inclined to support a dynamic program for victims of alcoholism? I think the answer is relatively simple. The public is appalled by the picture of the skidrow alcoholic which, for many persons, is synonymous with alcoholism. This is not the person seen in most of our clinics. Rather it is the problem drinker, with a family and a position

in the industrial community, striving to preserve his ties to society. If the alcoholic himself cannot present a sympathetic picture, then his wife and children may do so, because they will become community responsibilities unless the alcoholic breadwinner is assisted. The cost and danger of alcoholism to the drinker's employer and fellow workers is also a powerful argument for treatment.

### Relationships With Other Agencies

To a great extent, alcoholism clinics have operated as isolated units, even when located in health departments, and the cause has suffered seriously from this provincialism.

We cannot possibly handle all the alcoholics through specialized services. While there is a valid basis for continuing to require specialized facilities, particularly in large centers of population, to serve as demonstration projects and to handle special problem cases, most alcoholic patients can be cared for by the general agencies: mental health clinics, family care agencies, general hospitals, vocational rehabilitation services, and many others. Acceptance of alcoholics by the general agencies will result in utilization of their staffs' professional personnel, reduction of the stigma of alcoholism, and better management of individuals and families with a complex of many problems.

To achieve such acceptance, we have two tasks to do. The first is to encourage the general agencies to feel that they can serve the alcoholic patient effectively. The reluctance of the physician, the social worker, or the vocational counselor to provide services for alcoholics is not too surprising. Their experiences have been frustrating and disappointing. But care of the aged was also rejected by many physicians and other professional personnel until demonstrations revealed the achievements possible. Such demonstrations would serve the alcoholics, as well.

Second, we must train the personnel of the general agencies in the management of alcoholism. New York State has been operating a scholarship and training program to send individuals to the Yale Summer School of Alcohol Studies and to other special courses. During the past 3 years, 57 persons have received

experienced employee. It is now accepted that about 3 percent of the working force is alcoholic, although this proportion varies radically from one location to another. Most alcoholics are male, usually in the early stages characterized by blackouts, poor eating habits, lack of control, a sharp drop in efficiency, and, above all, absenteeism.

Absenteeism, he said, is estimated to be the chief cost of alcoholism. Even among those in executive and professional occupations, who tend to report to the office rather than stay home with a hangover, alcoholism exacts an economic toll because the alcoholic executive is in no condition to do a suitable day's work, he added, or to make sound decisions. There is evidence that by staying home alcoholics with heavier physical duties reduce the probability of accidents on the job. For this reason, the accident rate among alcoholics is not as high as formerly assumed.

Another economic cost, immediately shared by their co-workers, results from efforts to shield the alcoholic from detection, to cover up for his failures, with a consequent impairment of responsibility in the non-alcoholic working force.

## *One Company's Plan*

Dr. C. Anthony D'Alonzo, assistant medical director of E. I. du Pont de Nemours & Co., described the simple and relatively inexpensive plan for treating alcoholic employees that the company has evolved over a 16-year period. A recent study of 87,131 employees uncovered 950 alcoholics: 66 percent of these have been rehabilitated, 23 percent have improved but have not fully recovered, and 11 percent are unchanged or their status is uncertain, he said.

Two attitudes, frank recognition of the alcoholic by fellow employees and the concept that alcoholism is a disease, underlie the company's plan, he stated. A full-time employee who is a recovered alcoholic and a member of AA gives talks to plant groups, emphasizing the importance of identifying the problem drinkers among their co-workers.

When an alcoholic is identified, the plant physician, the adviser on alcoholism, or a mem-

## **Key Characteristic**

"Industry on the whole has acquired a key characteristic of the individual problem drinker—the tendency to hide the problem," stated Dr. Selden Bacon, director of the Center of Alcohol Studies, Yale University, at a meeting of the Washington, D.C., Area Council on Alcoholism, held October 21, 1959. He cited a study in a company employing 10,000 persons which "showed problem drinkers drew three times as much in sickness benefits, were absent 2.5 times as often, and had three times as many accidents as other company employees who were matched with the problem drinkers for age, sex, years with the company, job status, and ethnic origins." . . . "Industry is throwing hundreds of thousands of dollars a year down a rat hole by avoiding competent industrial analysis of employee alcoholism," Bacon declared.

ber of AA orients the patient to the firm's attitude that alcoholism is a disease, and he is given every opportunity for rehabilitation. Cooperation with AA has given by far the best results, declared D'Alonzo, and when psychiatrists work closely with this organization, the results are further enhanced.

The amount of time given an employee to recover and whether or not he receives leave from work depend on his age, years of service, previous opportunities, nearness to retirement age, temporary or permanent complications of the disease, and the employee's attitude and sincerity. Often no leave from work is desirable; experience has taught us that alcoholics do better with surveillance on the job, D'Alonzo declared. In the absence of medical complications it is rare that more than 2 weeks' leave, which is granted only for institutional treatment, is necessary.

The controlled alcoholic is a good employee and he is good for other employees. He is worth saving, declared D'Alonzo.

## *Industry-Supported Clinic*

The industry-supported Consultation Clinic for Alcoholism regards helping the patient to recognize his problem and motivating him toward treatment as important factors in re-



# ALCOHOLISM IN INDUSTRY

**CONFERENCE REPORT.** "Modern Approaches to the Problem Drinker in Industry" was the subject of one session at the annual meeting of the National Council on Alcoholism, held in New York City, March 22-25, 1960. Following are summaries of three papers describing these approaches.

## *New Attitudes*

Introducing a session on control of alcoholism in industry, Prof. Harrison Trice of Cornell University reviewed the changes in attitude and understanding of drinking that had emerged in the last 25 years. In the 1930's, he said, objective study was beginning to replace emotional opinions about alcoholism, and diagnosis and treatment were coming to replace moral condemnation, ostracism, or punishment of the drinker. Conventionally, alcoholism is now spoken of more as an illness, he said, than as evidence of degeneracy or a basis of social disgrace.

The arsenal of management, Trice stated, is limited so far to experimental methods which include psychiatry; chemical prescriptions; dietary programs; changes in the physical, social, or working environment; or reconstruction of habit patterns. Evaluation of such efforts so far, he said, needs more attention.

Objective studies by Jellinek, Bacon, Straus, and Henderson, Trice reported, have corrected illusions about the character of the alcoholic personality. Such studies, he said, fail to iden-

tify alcoholism with any special occupation, background, or character. Alcoholics, the investigators found, were in many ways stable, active, and on the job, rather than social rejects. More often than not they are middle-aged, in the early and medium stages of alcoholism, rather than far gone or full blown, in the condition of a desperate lush.

Industry also has changed its attitude, he said, veering away from a resolute blindness, comparable to an earlier attitude toward venereal disease, through a stage when it was considered poor public relations to take a position on the liquor issue, toward a progressive policy of enlightened, scientific management.

As recently as 1955, Trice said, management and labor began jointly to pick up the trail blazed by a few progressive companies, with an increased interest in rehabilitation. By now, more than 100 major companies have formulated policies along such lines, although not all have developed programs of identification, diagnosis, and treatment or rehabilitation.

In part, this change has been simply humanitarian, he said, and in part, a realization of the value to be realized from saving a trained and

experienced employee. It is now accepted that about 3 percent of the working force is alcoholic, although this proportion varies radically from one location to another. Most alcoholics are male, usually in the early stages characterized by blackouts, poor eating habits, lack of control, a sharp drop in efficiency, and, above all, absenteeism.

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### ***Industry-Supported Clinic***

The industry-supported Consultation Clinic for Alcoholism regards helping the patient to recognize his problem and motivating him toward treatment as important factors in re-

covery, stated Dr. Frances I. Colonna, acting director of the New York clinic.

The treatment of alcoholics can be fostered, she said, if the company's approach is a dual one: offering the alcoholic treatment at the clinic at the same time he is informed that the company feels he has a drinking problem. Also, by finding the patient in the early phases of his illness one hopes to prevent the consequences of unchecked alcoholism, which can lead to serious mental and physical changes, she said.

The clinic undertook the treatment of employed alcoholics in 1952 when its operation was underwritten by Consolidated Edison Co. of New York, Standard Oil Co. of New Jersey joining in later. Approximately 30 companies are now using its facilities. The clinic is under the direction of the departments of psychiatry and industrial medicine of New York University Medical Center.

The staff consists of an internist, psychiatrist, and psychologists. Following referral, the procedure includes a physical examination by the internist, laboratory and psychological tests, and an interview with the psychiatrist. An attempt is made to establish a relationship which will help to motivate the patient for treatment and to investigate those areas of his personality which are pertinent to the drinking problem, Colonna stated.

A treatment plan suited to the patient's needs

is formulated, she said. This may be individual psychotherapy of a direct supportive type, or for some, psychotherapy of a more probing nature. For many, group therapy offers the most effective treatment. They benefit from interaction with other patients. Various medical therapies are also used. The clinic may also enhance the treatment program by making use of community resources such as Alcoholics Anonymous and religious groups, and the family physician.

Since the clinic is open every day, it has been able to handle some patients in a state of acute intoxication by seeing them daily until they are ready to enter into long-term treatment, Colonna stated.

Among the advantages of a separate treatment center situated within a hospital are the disassociation of the treatment from the company. It is also of extreme importance that the patient feel his communications are confidential if he is to be free to express his feelings.

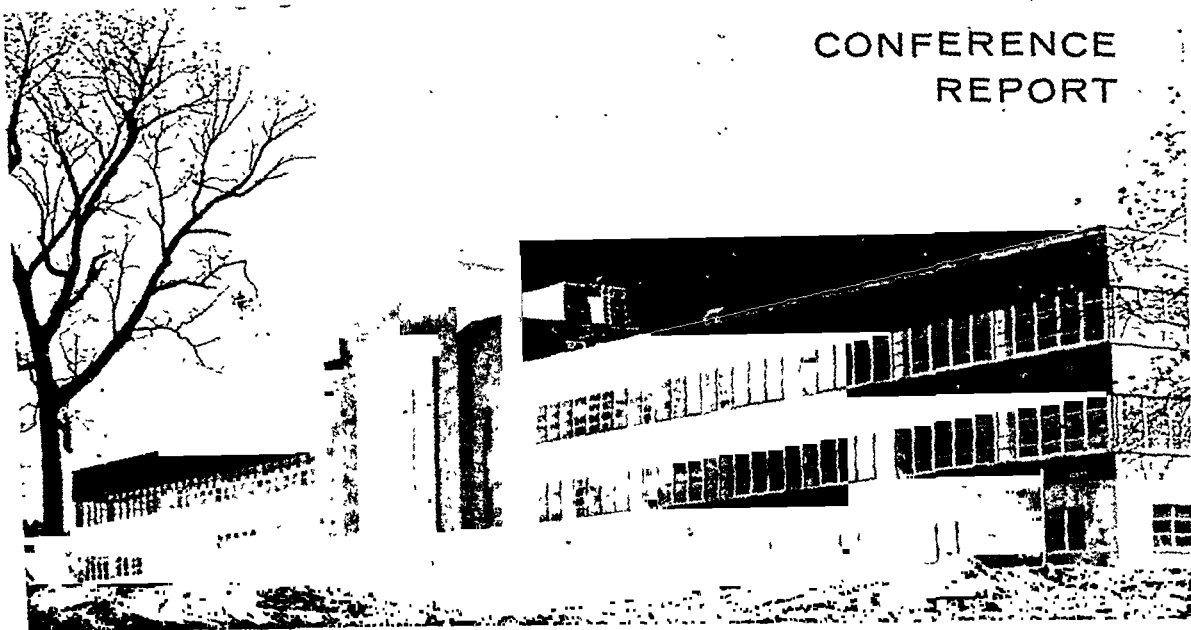
Such a clinic within a teaching unit also encourages the participation of a research-minded staff who are interested in understanding the problems of alcoholism in general. Extrinsic motivation provided by the company's procedure and intrinsic motivation as developed by the therapeutic situation make for the most favorable conditions for treatment and for bringing about constructive changes in the patient's alcoholism, Colonna concluded.

### Median Salaries of Scientists, 1956-58

The median annual salary of scientists in the United States during 1956-58 was \$7,900, according to a National Science Foundation survey of its 1958 National Register of Scientific and Technical Personnel. About 137,000 scientists reported for the register during that period.

Other findings show that scientists in chemical engineering and the medical sciences had the highest median salaries (more than \$10,000), and those in the agricultural and biological sciences were lowest, with salaries below \$7,000. The highest median salary was reported by those in management or administration (\$11,000); those in teaching, the lowest (\$6,500).

About 250,000 scientists reported their professional and economic characteristics in May 1960 for the 1960 national register.



# Blue Grass Progress

Dr. Russell E. Teague, State commissioner of health, presented a glowing progress report to the 12th annual meeting of the Kentucky Public Health Association in Louisville, April 6, 1960.

Despite the travail of moving that week to a new State health department building in Frankfort, he managed to outline a total health program geared to the times and to describe achievements and accomplishments to date.

Since 1955, Kentucky has had in each county a full-time health department. Formerly concerned mainly with communicable disease, vital records, and sanitation, their programs now include medical care, preventive services, and environmental control.

Reorganization of the State department was facilitated by a survey conducted at the commissioner's request by the Public Health Service. The document prepared by this survey was instrumental in providing the public and official support necessary to amplify the State's activities. Recognition by Kentucky of the need for additional health resources is further illustrated by the development of the University of Kentucky Medical Center to provide

training for physicians, dentists, nurses, and other health personnel. Rather than establish a graduate school of public health in Kentucky, the State appropriated a sum equivalent to \$1,500 per student per year to aid the three existing graduate schools of public health in the south.

A program to begin in January 1961 will provide medical care to recipients of public assistance. Jointly administered by the departments of economic security and health, the program's scope will be recommended by an 11-man advisory council. Payments for medical care will be on a cost basis. A local medical review committee consisting of three physicians and a dentist will be appointed in each county.

With Federal aid under the Hill-Burton Act, new health department buildings have been erected in 50 counties, and 12 more are under construction.

Two years' demonstrated experience in the home care programs for the chronically ill of seven selected county health departments has encouraged Teague to look forward to providing such care throughout the State. In this program, public health nurses, physical ther-

apists, nutritionists, health educators, and others of the county department staffs work under the direction of local private physicians.

A division of behavioral sciences in the State health department is expected to conduct research into the actualities of public attitudes, needs, and habits, especially to determine what the public will expect from medical care programs.

A new division of radiological health is to be set up this year. A file of sources of ionizing radiation in the State is already being established.

The occupational health program has been supported by heavy investments in instruments for appraising the working environment. A survey of occupational health facilities has also begun. Increased activities in air pollution will be established.

Employee health services in the department include a preemployment physical examination, first aid, and nominal medical care. Measures for control of tuberculosis have confined X-ray screening to suspect populations and have expanded tuberculin testing. Employees were authorized to claim 8 cents instead of 7 cents for mileage on private cars used officially.

On the whole, the Kentucky State Health Department battled 1,000 on legislation in the 1960 State General Assembly.

## Alcoholism

Public health nurses at the Kentucky meeting devoted considerable time to discussions of the management of alcoholism.

They heard Dr. R. R. Knowles, superintendent of the Kentucky State Hospital, at Danville, state that it is a responsibility of public health agencies to establish in the public mind the concept that alcoholism is an illness, rather than a sin or a sign of degeneracy. The implication of this concept, he said, is that instead of scorning or punishing the alcoholic, society is prepared to seek the factors in the host and environment which promote, provoke, and perpetuate alcoholism. Health agencies, rather than courts and jails, may then be encouraged to treat the victims.

Public health professions, he said, may rise to their opportunity by learning how to rec-

ognize and manage incipient alcoholism, supporting treatment, developing rehabilitation services, and following up released patients to prevent a recurrence. A variety of educational programs, suited to diverse ages and cultures, he said, may prove to be the health agency's most important responsibility of all.

Dr. Robert Straus, chairman, department of behavioral science, College of Medicine, University of Kentucky, told the nurses that alcoholism usually tends to develop only after repeated exposures to high concentrations of alcohol in the bloodstream. He noted that the custom of drinking was not in itself a cause of alcoholism, but that variations in drinking customs were important factors in "exposure" to alcoholism.

In support of this, he noted that alcoholism was rare among Jewish and Italian families who were nearly all accustomed to taking wine with meals. On the other hand, among Irish families, although perhaps 40 percent touch no liquor at all, the incidence of alcoholism was relatively high.

The difference he related in part to the tendency in some cultures to drink distilled liquors, having a relatively high alcoholic content, with no foods in the stomach to slow down the absorption of alcohol. Their saying is, "Why spoil a good drink with food?" He mentioned also that some cultures tend to condone intoxication, especially in single males, whereas others frown upon it.

He mentioned also that the rate and volume of drinking will build up the high concentrations which predispose toward alcoholism. Drink for drink, he said, a lightweight will build up higher concentrations more quickly than a heavy person.

He observed that with drinking habits changing among Italian and Jewish families, as the younger members adopt the cocktail hour and distilled liquors instead of wines, alcoholism is becoming more frequent among them.

Responding to a question from the floor, Straus said that 20 years ago most people equated alcoholism with the "typical skidrow character." Since then, he said, some important research has led to a modification of the old concept of the alcoholic personality. Instead of being restricted to the skidrow homeless

man, the alcoholic is to be found in all ranks of society, high and low, in all kinds of occupations. Many are even able to function in a relatively stable and constructive manner during periods of sobriety.

The skidrow personality, he said, represents a different pattern. Typically he is a dependent personality, product of a broken home or orphanage, accustomed to having matters arranged for him, as in a military organization, the merchant marine, an institution, or a job in an institutional type of setting such as a lumber camp or a resort. Unaccustomed to demands on initiative, he may be frightened by some activity as simple as having to take a streetcar. If he drinks, it is often to cope with the terrors of an unprotected environment, said Straus. As a rule, his drinking is not addictive but planned; not seeking peak intoxication but a plateau of alcohol-induced oblivion from responsibilities. Sometimes he even uses drinking as a method for getting into the protective confines of the jail.

Straus cited these examples to emphasize the importance of realizing that drinking is usually a method of dealing with another kind of problem. The movement for social management of alcoholism, he said, is based upon this premise, and is moving therefore from a narrow focus on alcoholism to a consideration of pathological

drinking in the context of health and welfare needs as a whole.

Young people tend to drink, or smoke, he reminded his audience, because these appear to be the actions of adults, and they hope to attain adult status by this method in a culture where social maturation comes much later than biological maturation. To control these habits in the beginning, he said, other patterns for imitation of adults would have to have equal status.

Public health agencies, and nurses especially, he said, can do a great deal to improve the situation, even if they do no more than explain matters to the family.

Reviewing the session with the public health nurses, Miss Mildred Kingcade, consultant in the Kentucky Department of Mental Health, stimulated a general discussion which brought out specifically the suggestion that alcoholic patients discharged from hospitals could be referred to health agencies for followup.

The nurses also expressed some uncertainty about how to go about explaining matters to a wife whose husband has seized the grocery money and slammed her against the wall, on his way to the saloon.

The main consensus, however, was that nurses must learn to accept the alcoholic person as a patient, learn to listen sympathetically, and advise intelligently, if they are to help.

## Alcohol and Highway Fatalities in Baltimore

A study of 500 consecutive highway fatalities in Baltimore, Md., in which victims died within 12 hours after injury, shows that 37.2 percent of 156 drivers killed were under the influence of alcohol or drunk, as were 26.3 percent of 137 passengers and 30.9 percent of the 207 pedestrians who died.

Results of the study, which covered motor vehicle casualties from January 1951 through April 1956, were presented at the 9th annual meeting of the American Academy of Forensic Sciences in February 1957 at Chicago, by Dr. Henry C. Freimuth, Spencer R. Watts, and Dr. Russell S. Fisher, of the office of the chief medical examiner, State of Mary-

land, and the University of Maryland School of Medicine, Baltimore.

A further breakdown of the figures revealed that 67 percent of the drivers under the influence of alcohol were less than 40 years of age and that 70.3 percent of the pedestrians definitely affected were above that age.

The State of Maryland has established the official definition of the expression "under the influence of alcohol" in terms of alcohol concentration. A 1959 law stipulates that an individual is in that condition if tests show alcohol concentrations of 0.15 percent by weight of his blood sample, an equivalent quantity of 2.000 cc. of his breath, or 0.20 percent by weight of urine.

apists, nutritionists, health educators, and others of the county department staffs work under the direction of local private physicians.

A division of behavioral sciences in the State health department is expected to conduct research into the actualities of public attitudes, needs, and habits, especially to determine what the public will expect from medical care programs.

A new division of radiological health is to be set up this year. A file of sources of ionizing radiation in the State is already being established.

The occupational health program has been supported by heavy investments in instruments for appraising the working environment. A survey of occupational health facilities has also begun. Increased activities in air pollution will be established.

Employee health services in the department include a preemployment physical examination, first aid, and nominal medical care. Measures for control of tuberculosis have confined X-ray screening to suspect populations and have expanded tuberculin testing. Employees were authorized to claim 8 cents instead of 7 cents for mileage on private cars used officially.

On the whole, the Kentucky State Health Department battled 1,000 on legislation in the 1960 State General Assembly.

## Alcoholism

Public health nurses at the Kentucky meeting devoted considerable time to discussions of the management of alcoholism.

They heard Dr. R. R. Knowles, superintendent of the Kentucky State Hospital, at Danville, state that it is a responsibility of public health agencies to establish in the public mind the concept that alcoholism is an illness, rather than a sin or a sign of degeneracy. The implication of this concept, he said, is that instead of scorning or punishing the alcoholic, society is prepared to seek the factors in the host and environment which promote, provoke, and perpetuate alcoholism. Health agencies, rather than courts and jails, may then be encouraged to treat the victims.

Public health professions, he said, may rise to their opportunity by learning how to rec-

ognize and manage incipient alcoholism, supporting treatment, developing rehabilitation services, and following up released patients to prevent a recurrence. A variety of educational programs, suited to diverse ages and cultures, he said, may prove to be the health agency's most important responsibility of all.

Dr. Robert Straus, chairman, department of behavioral science, College of Medicine, University of Kentucky, told the nurses that alcoholism usually tends to develop only after repeated exposures to high concentrations of alcohol in the bloodstream. He noted that the custom of drinking was not in itself a cause of alcoholism, but that variations in drinking customs were important factors in "exposure" to alcoholism.

In support of this, he noted that alcoholism was rare among Jewish and Italian families who were nearly all accustomed to taking wine with meals. On the other hand, among Irish families, although perhaps 40 percent touch no liquor at all, the incidence of alcoholism was relatively high.

The difference he related in part to the tendency in some cultures to drink distilled liquors, having a relatively high alcoholic content, with no foods in the stomach to slow down the absorption of alcohol. Their saying is, "Why spoil a good drink with food?" He mentioned also that some cultures tend to condone intoxication, especially in single males, whereas others frown upon it.

He mentioned also that the rate and volume of drinking will build up the high concentrations which predispose toward alcoholism. Drink for drink, he said, a lightweight will build up higher concentrations more quickly than a heavy person.

He observed that with drinking habits changing among Italian and Jewish families, as the younger members adopt the cocktail hour and distilled liquors instead of wines, alcoholism is becoming more frequent among them.

Responding to a question from the floor, Straus said that 20 years ago most people equated alcoholism with the "typical skidrow character." Since then, he said, some important research has led to a modification of the old concept of the alcoholic personality. Instead of being restricted to the skidrow homeless

three small cities and the rest in rural and semi-rural areas. The median income of the area is above the national average, and its population is well served by the usual number of official and voluntary health agencies. General concern and information about health matters is comparatively good.

## Method

The diabetes screening program is conducted in itinerant clinics which everyone 20 years of age or older is eligible to attend. The bureau of chronic diseases and geriatrics of the New York State Health Department supplied a clinitron (on loan from the Public Health Service), a trained technician to conduct the clinics, and sufficient reagents and equipment to start the program. The local tuberculosis and health associations in the three counties donated a total of \$325 for the purchase of operating supplies in addition to those supplied initially by the bureau.

The technician carries to each clinic the necessary supplies with which to register and take blood specimens from those attending. A specimen consists of 0.1125 ml. of arterial blood taken from a fingertip, which is mixed immediately with 5 cc. of fluoridated distilled water (approximately 1 grain sodium fluoride per gallon of distilled water). At the end of each clinic the technician returns to the district office, where the clinitron is permanently set up, and runs the specimens through the clinitron. Practically all are processed within 24 hours, and in no instance do they stand more than 48 hours, although by fluoridating the diluent a delay of several days is considered permissible (4).

Clinitron testing of 0.1125 ml. specimens, using the appropriate reagent tablet, gives positive results for specimens with blood sugar levels of 160 mg. or more (4). For the first 5 months of program operation no attention was paid to the time interval between the last meal and the time when a blood specimen was obtained. However, because some of the local physicians complained that too many of the test results were false positive, from October 1, 1958, to April 1, 1959, no one was tested who had eaten less than 2 hours before clinic time.

Since April 1, 1959, all persons have been tested as they presented themselves, regardless of time since eating.

This misunderstanding points up the failure of our attempts at professional education. Before the program was started, several meetings with each of the three county medical societies were held to explain the details of the screening program. At these meetings we tried to establish a standardized procedure for followup by asking the physicians to determine at least one postprandial blood sugar level for each of the patients referred to them with positive screening test results. We emphasized the recommendation of Wilkerson and Heftmann that a blood sample for screening by the clinitron be taken shortly after a meal, and announced that clinic sessions would therefore be scheduled at times when most screenees would be in a postprandial state.

To reinforce these points and the details of the program, a letter was sent to each physician in the district, repeating what had been said at the medical society meetings. However, the educational aspect of these presentations apparently misfired, as the majority of the physicians still believe that fasting specimens are the only proper ones to take.

For the first 2 months of program operation, the only specimens screened were obtained, in their offices, by about one-third of the private physicians of a single county. The technician for the screening program collected these specimens twice a week. However, the number of specimens supplied by physicians fell off rapidly after the first 6 weeks, and once the community clinics started up, the technician no longer had time to collect them. We found it impossible to recruit volunteers for this purpose, and so, beginning in May 1958, collection of specimens from physicians' offices was abandoned and program efforts were concentrated on local clinics.

Every community in the district was listed and a schedule of clinics set up so that each would have at least one clinic a year. At first, the basis for scheduling more than one clinic a year for certain communities was size of population, which varied from a few hundred to 20,000.

County public health nurses participate in



# Continuous Diabetes Screening in a Rural Area

WILLIAM J. MEYER, M.D., M.P.H.

FOR a chronic disease problem to justify the institution of a public health service program, it must conform to essentially the same criteria as other disease problems: (a) there must be available either a means of prevention or an effective treatment, (b) the problem must be of such a nature that it (or a significant part of it) cannot be solved by the traditional physician-patient relationship, (c) the problem must affect a significant number of people, and (d) it must have community significance.

Casefinding in diabetes mellitus conforms to the above criteria. Although no method of primary prevention is known other than control of heredity (which in our present society is not very practicable), early diagnosis and continuous medical supervision can prevent the early complications of diabetes, and some of the late complications can be avoided or postponed (1a). Relatively few people have formed the habit of presenting themselves for routine physical checkups, with the result that no opportunity is presented to diagnose an estimated 50 percent of those who have diabetes. The problem is large; it is estimated that there are over 2 million diabetics in the United States (1b), half of whom are unknown. Finally, the disease has an important degree of significance to the community, as it causes a considerable amount of disability, premature death, loss of productivity, and increased demands on health and welfare facilities (2).

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*Dr. Meyer was health officer for the Glens Falls District, New York State Department of Health, at the time this paper was written. He is now director of health in Bucks County, Pa.*

Diabetes detection programs have been conducted for some years and are an accepted part of the public health scene. There are many types of programs, which vary, in time, from 1-day drives to year-round activities, and in technique, from rapid screening for sugar in the urine to exact, painstaking, and expensive blood determinations.

Justification for the operation of a diabetes detection program is based on the hypotheses that diabetes mellitus is often unrecognized and asymptomatic in the adult; that early diagnosis and treatment of diabetes improves prognosis and reduces complications; and that it is practical to screen postprandial hyperglycemic individuals from the general population by means of a community-operated clinic service (3).

One of the best methods of conducting such a screening program is by means of the test developed by Wilkerson and Heftmann (4), using the clinitron. This apparatus provides a rapid, inexpensive, and reasonably accurate method of screening large groups of people.

Permanent, year-round diabetes screening programs using the clinitron seem to have been restricted thus far to urban populations. On March 1, 1958, the Glens Falls District Office of the New York State Health Department began a continuous screening program in a rural section of upstate New York, including Saratoga, Warren, and Washington Counties. Data during the first 10 months of operation are presented in the hope that they will contribute toward closing the gap between urban and rural public health practice in diabetes screening.

The population of this tricounty area approximates 177,000, 25 percent of whom live in

**Table 3. Deviation from normal weight<sup>1</sup> of screenees for whom weight was known, March 1–December 31, 1958, Glens Falls Health District, N.Y.**

Test results	Number			Percent overweight						Percent underweight					
				Any amount			20 percent or more			Any amount			20 percent or more		
	Total	Male	Female	Total	Male	Female	Total	Male	Female	Total	Male	Female	Total	Male	Female
Total persons tested	3,703	1,145	2,558	73.5	78	72	26	22	28	26.5	22	28	1.6	1.3	1.8
Total positive tests	178	75	103	84	84	85	46.5	36	54	16	16	15	0	0	0
Confirmed positive <sup>2</sup>	102	44	58	83	82	84	48	34	55	17	18	16	0	0	0
Previously unknown	51	17	34	83	85	82	51	46	54	17	15	18	0	0	0
Previously known	51	27	24	84	81	87	45	35	57	16	19	13	0	0	0

<sup>1</sup> According to standard height-weight tables of the Metropolitan Life Insurance Company.

<sup>2</sup> Percentages are expressed in relation to number of positive tests.

weight to the same degree in the total population tested. The difference in percentages is essentially the same in those proved to have diabetes. Conversely, similar comparisons for those who are underweight show consistently lower percentages, while no person 20 percent or more underweight had a positive test. These findings conform to the usually held concepts concerning the relationship between diabetes and obesity.

Table 4 shows the relationship between those with positive tests and those with positive tests confirmed, according to the interval between the last meal and the time of test. It will be seen that both the case rate and the percentage of false positives fall off after 1 hour, indicating

that the test becomes less sensitive but more specific with the longer intervals after eating.

The source of referral to screening clinics for those patients who indicated a source was as follows:

Referral source	Patients
Private physician	400
Public health nurse	99
Newspaper	2,283
Radio	110
Family	30
Friend	219
Health agency	23
Other	528
Total	3,692

The newspaper has been the most effective source of publicity so far. However, it is likely

**Table 4. Results of diabetes screening tests, according to time between last meal and taking of blood specimen for screenees on whom time interval was known, March 1–December 31, 1958, Glens Falls Health District, N.Y.**

Time interval between last meal and test (hours)	Total tests	Positive test results			Case rate (percent confirmed positive of total tests)	Percent true positives of total positives
		Number	Percent of total tests	Number confirmed		
Total	3,690	136	3.7	74	2.0	54.4
Less than 1	898	58	6.5	26	2.9	44.8
1–2	1,515	46	3.0	25	1.7	55.3
2–3	911	24	2.6	17	1.9	70.8
3 or more	366	8	2.2	6	1.6	75.0

**Table 1. Results of diabetes screening, March 1–December 31, 1958, Glens Falls Health District, N.Y.**

Results	Number (3,851)	Percent (100)
Positive test results.....	183	4.8
Confirmed positive <sup>1</sup> .....	102	2.7
Previously known.....	51	1.3
Previously unknown.....	51	1.3
False positive <sup>1</sup> .....	76	2.0
Final diagnosis unavailable.....	5	.1

<sup>1</sup> According to physicians' diagnoses.

the program in two ways. Because of their familiarity with the communities and their experience in recruiting volunteers, county public health nurses were asked to recruit and brief volunteers for the program. At each clinic, volunteers act as registrars, arrange for clinic sites, and help spread the word about the clinics. The nurses also follow up persons whose tests are positive and who do not report to their personal physicians for further testing.

All available mass publicity media are used. Arrangements have been made for frequent radio spot and station break announcements. Before the screening program started and during its early operational stages, local newspapers carried a number of informational articles. They publish clinic schedules and articles urging everyone over the age of 20 to attend a clinic and those with positive tests to obtain more definitive diagnostic services from a private physician. The local public health nurses and the volunteers they have recruited conduct a

word-of-mouth publicity campaign for the clinics. In each locality the campaign is stepped up for several weeks before a clinic is scheduled to be held in the area.

## Results

During the first 10 months of operation, March 1 through December 31, 1958, a total of 3,851 specimens were tested, with 183, or 4.8 percent, testing positive. Of these 183 positive tests, a final diagnosis is available for 178, with 5 cases lost to followup. Seventy-six of the 178 proved not to have diabetes, 51 were previously known diabetics, and 51 new, previously unknown diabetics were discovered. These 51 previously unknown diabetics constitute 1.3 percent of the total number tested. Table 1 shows these results.

Table 2 gives the number and percent of the total population tested and the number of new cases found among those for whom age was known, by age groups. The highest percentages of total population tested were within the 40- to 70-year age group, the primary target for diabetes screening (5). Although this age group represented only 63 percent of those tested, 78 percent of the previously unknown cases of diabetes fell within it.

Table 3 shows the percentage deviation from normal weight for those tested, those who tested positive, and those proved to have diabetes. Of the persons with positive tests, 46.5 percent were overweight by 20 percent or more. This may be compared with 26.0 percent over-

**Table 2. Age and sex distribution of confirmed new cases of diabetes in relation to total population and persons tested, March 1–December 31, 1958, Glens Falls Health District, N.Y.**

Age (years)	Total population			Number tested <sup>1</sup>			Percent of total population tested <sup>1</sup>			Previously unknown cases		
	Total	Male	Female	Total	Male	Female	Total	Male	Female	Total	Male	Female
All ages.....	177, 636	87, 424	90, 212	3, 735	1, 176	2, 559	2.1	1.3	2.8	51	17	34
0-19.....	57, 031	28, 532	28, 499	72	30	42	0.13	0.1	0.15	0	0	0
20-39.....	50, 120	24, 536	25, 584	1 066	321	745	2.1	1.3	2.9	6	2	4
40-49.....	22, 650	11, 235	11, 415	889	282	607	3.9	2.5	5.3	10	2	8
50-59.....	19, 758	9, 809	9, 949	842	244	598	4.3	2.5	6.0	14	5	9
60-69.....	15, 778	7, 740	8, 038	603	195	413	3.8	2.5	5.1	16	7	9
70 and over.....	12, 299	5, 572	6, 727	258	104	154	2.1	1.9	2.3	5	1	4

<sup>1</sup> Includes only those for whom age is known.

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that many were motivated to attend clinics by local word-of-mouth publicity and were merely reminded of the time and place through the newspapers.

## Costs

Table 5 gives the actual cost of the program for the first 10 months, so far as can be determined. No charge has been made for such items as light, heat, stationery, and office space, as it is impossible to determine these with any degree of accuracy. The item for stenographic services is somewhat arbitrary and has been taken as 25 percent of one stenographer's total time. This figure is derived from the actual stenographic time spent on the program during a 10-week interval.

Tables 5 and 6 separate expenses into fixed and variable types, because such a method provides additional information of value in predicting the future cost of the program as it expands. The fixed cost per test performed in the first 10 months of operation was \$1.07 and the variable cost was 32 cents, a total of \$1.39. Similarly, the costs per new case found were \$80.55, \$23.99, and \$104.54, respectively.

These costs are approximately 50 percent higher than those reported for programs in urban areas (3,6). The excess is almost entirely accounted for by two facts: our program is itinerant in nature and therefore involves a considerable amount of travel expense, and it is conducted as an independent unit. Other programs in this general area of New York State

**Table 6. Relationship of diabetes screening costs to results, March 1–December 31, 1958, Glens Falls Health District, N.Y.**

Type of cost	Cost per person screened (N=3,851)	Cost per new case (N=51)	Total expense
Fixed cost.....	\$1. 07	\$80 55	\$4, 107. 85
Variable cost.....	. 32	23 99	1, 223 61
Total.....	1 39	104 54	5, 331 46

are usually conducted in conjunction with chest X-ray clinics, which makes it possible to divide certain costs between the two programs.

A word of caution is in order here. Comparison of costs in this program with the others mentioned is improper except in the very broadest sense. No uniform method of accounting has been used in the various programs, and therefore comparison between specific items is impossible. Only very large differences in costs can be indicated with the figures available.

## Administrative Problems

Of the four operational problems encountered, the first was in deciding where clinics should be held. As this was a new program to the local staff, there was no way of telling how large a community was necessary to make it worthwhile to hold a clinic, nor was there any way of predicting local response. Therefore, every concentration of population of more than

**Table 5. Operating costs of diabetes screening program, March 1–December 31, 1958, Glens Falls Health District, N.Y.**

Expense	Fixed cost	Variable cost	Total cost
Technician's salary (\$2,990 per year).....	\$2, 491 67	-	-
Stenographer's salary (\$3,610×¾ for ¾ of a year) .....	-	\$601 67	-
Technician's expenses			
General (meals, etc).....	378 75	-	-
Auto (16,600 miles @ 5 cents a mile) .....	830 00	-	-
Depreciation (\$300 per year).....	250 00	-	-
Equipment <sup>1</sup> .....	157 43	-	-
Supplies <sup>2</sup> .....	-	421 94	-
Postage.....	-	200 00	-
Total.....	4, 107 85	1, 223 61	5 331 46

<sup>1</sup> Includes depreciation on glassware, clinutron, refrigerator, and miscellaneous equipment

<sup>2</sup> Includes reagents, cleaning materials, finger lancets, cotton balls, alcohol Excludes cost of stationery

a few houses was assigned at least one clinic, with the thought that after a full circuit, those found unprofitable could be dropped from the schedule. This was a fortunate decision, for our experience indicates the size of the community in no way determines the public response. Some of our largest clinics have been held in areas that were sparsely populated.

Second, not all physicians use the same tests to verify a tentative diagnosis of diabetes. In this part of New York State, methods of diagnosing diabetes vary from examining random urine specimens to postprandial blood sugar tests.

At the beginning of the program, physicians were requested to determine at least one postprandial blood sugar for patients referred to them with positive tests. In practice, only a few have used this test. The great majority have used a single fasting blood sugar determination. Two or three of the more thorough physicians use glucose tolerance tests, while two perform only random office urinalyses in spite of the fact that they have been advised that the clinitron test is a more sensitive indicator of diabetes.

A third difficulty has been to obtain reports from physicians of final diagnoses for patients with positive screening results. In well over half the cases, two letters have been necessary, and in many instances a further reminder by telephone has been required. No physician has objected to supplying this information, but the general professional distaste for paperwork and its growing volume have increased the time spent in followup.

Finally, although considerable publicity through mass media has been maintained, it has been difficult for the district health officer to find adequate time for this very important aspect of the program. We feel that only the least possible amount of publicity consistent with results has been provided, and that, if more time were available for this purpose, response to the program could be significantly increased.

## Discussion

The major purpose of the diabetes screening program was to provide a local casefinding program for one more of the serious chronic

diseases, with the long-range goal of testing 10 percent of the population over the age of 20 each year. A secondary purpose was to increase knowledge by designing a successful rural application for a program which has heretofore been restricted to urban areas.

Much needs to be done in adapting programs for dispersed populations. Costs, local relationships, local participation, and many other administrative factors which determine the success or failure of a program vary in urban and rural settings. It is felt that in this program a good start has been made toward solving these problems.

It must be freely admitted that taking specimens 2 hours or more after the last meal is undesirable from a casefinding point of view, since it leaves undiscovered cases among those screened. Because of local unwillingness to accept the proportion of false positive results which occurs at high levels of test sensitivity, it was necessary to reduce the sensitivity of the test in order to increase its specificity. At present, there are signs that the program is gaining in acceptance. We hope that after the second year of operation the program will have proved of sufficient worth that specimens can be taken in accordance with the recommendations of Wilkerson and Heftmann.

The failure of most physicians to test individuals with positive screening results by determining a minimum of one postprandial blood sugar is a definite drawback and almost certainly causes a significant number of mild or latent diabetics to be overlooked. We can only hope these people will return for retesting at subsequent clinics, when some, at least, will present a more advanced and more easily diagnosed stage of the disease. We hope, also, that this will happen before too many of the adverse effects of diabetes have had a chance to assert themselves.

I have mentioned that the size of clinic attendance often bears no relationship to the size of the local population where clinics are held. The most successful responses seem to be related to the effectiveness of the word-of-mouth publicity by local volunteers and public health nurses. One of our current objectives is to identify the factors involved and apply them more universally.

A serious objection to the program at the present time is the high cost per test performed and per new case of diabetes found. Although \$104, the cost of finding a new case, compares favorably with that of finding a new case of syphilis or of tuberculosis, the situation is not exactly comparable. Though an unknown case of diabetes does not create new cases, it represents cost to the community in the form of disability, loss of productivity, premature death, increased welfare costs, and increased load on health facilities. Nevertheless, we feel that, compared with the cost of casefinding in urban settings, this figure is not excessive, but it is still too high (3,6).

Costs are expected to come down. By far the greater portion of these costs are fixed. Therefore, for every additional increase in the number tested, there will be a much greater proportional decrease in the cost per test and the cost per case found. It is expected that for at least the next several years the number of people tested will increase, thus automatically lowering both costs. However, unless some way is found for absolute reduction of the fixed cost, there is no hope of approaching the cost level in urban programs.

The number of new, previously unknown, diabetes cases found represents 1.3 percent of those tested. This is greater than both the usual estimates and the actual experience of similar programs. No explanation is immediately available.

### Summary

A year-round diabetes detection program was established in March 1958 in a tricounty rural section of upstate New York (Saratoga, Warren, and Washington Counties). The program's objectives are to offer a casefinding service in a serious chronic disease and to pro-

vide answers for some of the unsolved administrative problems in rural public health practice. Evaluation procedures were built into the original program design to permit periodic analysis.

Of the 3,851 persons tested during the first 10 months of operation, 1.3 percent proved to have previously unknown diabetes. This figure is undoubtedly low because of (a) the time interval between the last meal and the test and (b) the general non-use of postprandial blood testing by private physicians making final diagnoses of screenees with positive tests. This inadequate followup testing of positive screenees poses a problem for which no effective corrective action has as yet been devised.

Among the unsolved administrative problems the factor of cost looms large. It is felt that with expansion of the program as time goes on this difficulty will be reduced. The long-range goal is to test 10 percent of the population over the age of 20 each year.

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# Epidemiology of Endemic Cholera

THOMAS A. COCKBURN, M.D., and JAMES G. CASSANOS

THE MAIN epidemiological features of endemic cholera have been long known, with some of the original observations dating back nearly a century. The available information has been reviewed extensively by Pollitzer (1), and unless otherwise stated, all references are taken from this monograph.

By the end of the 19th century, the areas of endemicity had been clearly defined, the nature of the countryside in which it was found was described, the relationship of the disease to the weather, especially the monsoon, had been noted, and the inability of *Vibrio cholerae* to survive for long periods in water containing large numbers of competing organisms and the potentialities of the village tanks, or ponds of surface water, in spreading infection had been observed. The fact that the cholera vibrio could withstand a very high pH had been discovered and indeed utilized in isolating the organism in pure culture.

However, efforts to provide an explanation for these features have so far been unsuccessful. In this paper we have reexamined and confirmed some of these epidemiological features and offer a theory and supporting data to explain them.

The theory is that the tanks of water are, in fact, the main means of spread of the infection; the seasonal fluctuations of the disease and possibly the limitations of the endemic area are the results of fluctuations in the pH of the tank

water. Examination of a number of tanks over a period of a year has shown that in sunny weather the pH commonly rises from about 7.0–7.5 in the morning to as high as 10.0 and occasionally to 10.5 in the afternoon. But when it rains this rise is prevented, and the pH may fall below 7.0. These fluctuations are the result of the activity of the algae in the water which liberate either carbon dioxide or oxygen according to the intensity of the light available. This range of pH's would give an advantage to the vibrio in the water over other intestinal organisms and permit them to survive, and, through natural selection, may have been responsible for producing the alkaline-resisting capacities of the organism.

## Epidemiology of Cholera

Cholera has been known as a distinct entity since 1817. In severe epidemic classic form it appeared in Calcutta in 1817 and spread rapidly around the world in a great pandemic that was repeated no less than five times in the 19th century. The epidemiology of the epidemic type of infection was clearly worked out, with the spread being along the trade and pilgrim routes through the agencies of bad hygiene, polluted water, flies, and overcrowding. The most significant feature of these 19th century pandemics was that they died away, leaving no permanent foci outside Asia. In the 20th century these Asian foci rapidly dwindled down to one or two sharply localized areas. Today, the disease does not exist in Russia or China (personal communication from Prof. B. H. Pastukhov, of the 1958 Soviet Medical Mission to East Pakistan) or in Japan, the Philippines, Indonesia, or Ceylon (1), except when introduced from outside. In Thailand, cholera ap-

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pears for about 3 years at a time, but then is not seen for 5 or 7 years. It is not known whether the infection is endemic there or is repeatedly reintroduced. The only place where it has been found with regularity all the year round, year after year, decade after decade, has been the Indian subcontinent.

At the beginning of the 20th century, cholera seems to have been endemic in Burma, Bengal, and on the east coast of India near the sea and associated with rivers. However, in the course of 50 years, the geographic distribution of the endemic infection has progressively dwindled so that today, although the epidemic type is still likely to appear in most parts, only Bengal remains a permanent focus. Further research may show that cryptic or undiagnosed cholera is present in all seasons and years in places like Burma, Nepal, and Thailand; but until this has been demonstrated, Bengal must be regarded as the primary source of all epidemics. Therefore, should the infection be eliminated from Bengal, it would almost certainly disappear from the world.

### **The Endemic Area**

Bengal is mainly the land formed by the Ganges-Brahmaputra Delta. In the 1947 partition it was divided between India and Pakistan, and the eastern half is now East Pakistan. Ecologically, the two sides differ significantly; West Bengal has an enormous urban population centered on Calcutta, while East Pakistan is one of the most rural countries in the world. There are only two large towns in East Pakistan, Dacca with about 600,000 population and Chittagong with 300,000 and these have reached these proportions only since partition. So far as the cholera vibrio is concerned, Bengal must be regarded as one unit, for considerable numbers of people, presumably carrying with them the causal organisms of the disease, still move across the border.

Calcutta was founded by the British in the 18th century, and one is tempted to suggest that there is an association between this newly created concentration of people and the appearance of the disease in epidemic form in 1817. It is a great sprawling slum with most unhygienic conditions. The overcrowding is gross, and

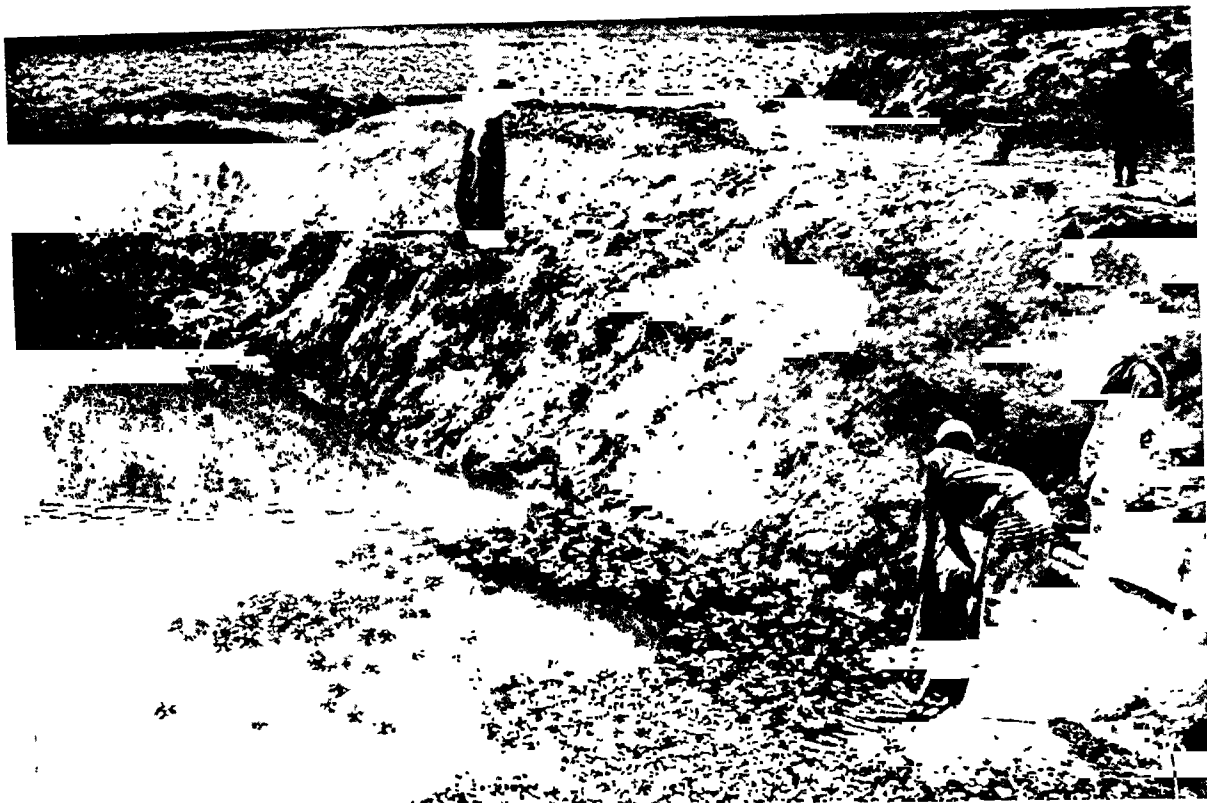
every night large numbers of people sleep on the streets and in the railway stations. Poverty is everywhere, and beggars are numerous. Half of the water supply is simply untreated crude river water. The river itself is highly polluted, and the cholera vibrio has been found in it at most times of the year.

East Pakistan is different. Here, about 45 million people, more than 95 percent of the population, live in small communities, each with its own farming area. Some have only a few individuals of one family, while others may hold up to several hundred persons. Where the land is most suitable for farming, the communities are smaller and only a hundred yards or so apart; where flooding is frequent, they are farther apart and larger. Since each group of houses is hidden by trees and surrounded by apparently empty fields of rice and jute, at first sight the countryside seems almost uninhabited; in reality it is one of the most heavily populated areas of the world, with nearly 1,000 persons per square mile.

The land is flat and only a few feet above sea level. Dacca Airport, about 100 miles from the sea, is 24 feet above sea level, and much of the coastal area is actually below the high-tide level, being protected by a system of dikes. The heavy rainfall of the monsoon and the huge masses of water pouring down the Ganges and Brahmaputra Rivers cause extensive flooding, and in most years about one-third of the land disappears under water. In real flood years, such as 1954, the larger portion of the delta area is submerged.

The inhabitants have become adapted to life under these conditions during many centuries. To cope with the floods, each hamlet or village has been built on a mound. The holes in the ground made by digging soil for these mounds are the tanks, and each village is usually surrounded by a number of them. In dry weather these tanks are the source of the water for the community, and a center of social life. Everyone visits them daily to wash clothes, for ablutions, to swim, to collect water for drinking and cooking, to fish, or to wash a cow or a buffalo. Sometimes there is a latrine perched on one end, and commonly when it rains the surface water from the houses flows into the tanks.

The houses are usually clean, with polished



**Woman drawing water at a tank as her family waits on the bank**

beaten mud and dung floors and little refuse lying around. Flies are not a major problem except around cattle sheds, and in the monsoon they are almost absent. Each family stores the year's supply of rice in large pots. After the monsoon starts in July, the mounds with their dwellings stick above the water like little islands. Nearly all roads disappear, and the villagers travel by their boats, which during the dry weather have been lying submerged in the tanks. At any time the rivers are the main highways of the Eastern Province, but during the monsoon almost everything goes by water. Water transport by sail or oar is slow, and 10 miles can be a hard day's journey. North of Dacca, the land rises slightly and is more heavily wooded, so that these conditions are found largely only along the rivers.

#### **Patterns of Occurrence**

In Bengal cholera occurs all the year round in both the rural areas and Calcutta. Calcutta has long been the industrial and commercial

heart of Bengal, and every day tens of thousands of people from the rural areas pour into it, although since partition those from East Pakistan have been diverted to Dacca. Since the infection is, without doubt, endemic in the rural areas, almost every day the vibrio must be reintroduced into Calcutta and Dacca.

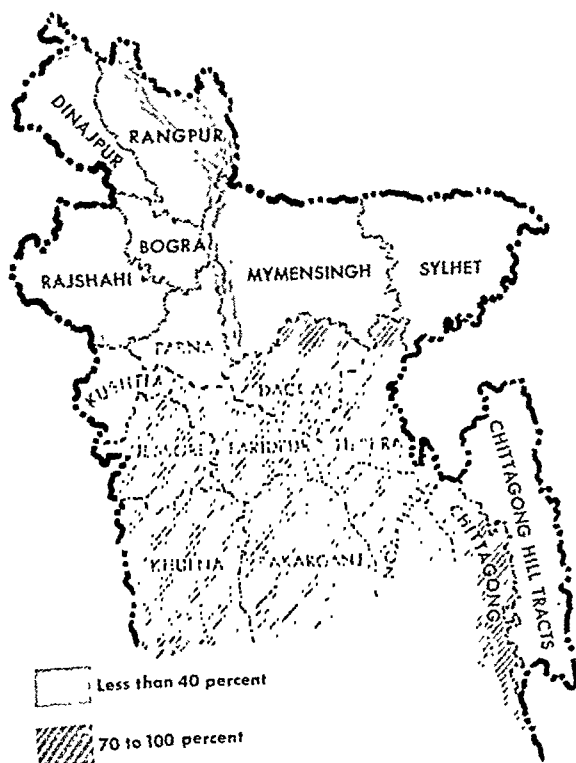
Many years ago a number of workers delineated the extent of the rural endemic area in Bengal. It consisted of the coastal region and extended inland to include Rajshahi District. North of that, cases of cholera were numerous, but only in the dry season. This situation is much the same today. In figure 1, based on the weekly reports of the Province's Directorate of Health Services, the districts of East Pakistan are marked according to the proportion of weeks in which cholera was reported over a 4-year period. About 150 miles inland, parallel to the coast, but now south of Rajshahi, there is a clear line of demarcation. North of this endemic borderline cholera is reported in the dry season only, 40 percent of the total weeks or less. South of it, the disease occurs 70-100

percent of the weeks, or all year round when allowance is made for the deficiencies of the reporting system.

On a map of the Province marked with 250-foot contours, the endemic and nonendemic areas seem to be identical except for some slightly higher ground north of Dacca and the range of hills to the east. However, in this flat land even a few feet make a big difference, and in general, except for the land along the river bottoms, the terrain rises gently to the north of the endemic borderline; south of it the land is universally flat and barely above sea level. This affects drainage, for as described by Macnamara, the water in the endemic area is almost stationary in the dry season.

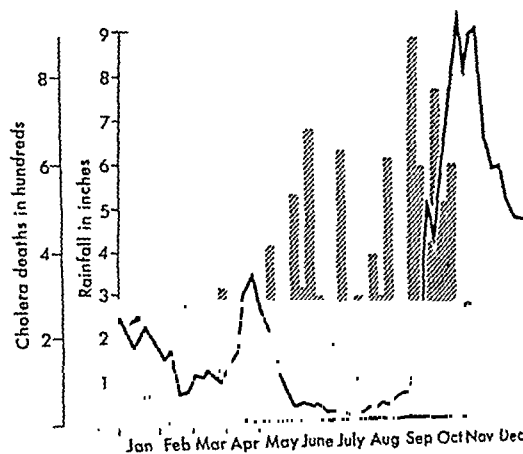
The spread of cholera in the rural area differs from that in the city, for there is little overcrowding in the small hamlets except during the monsoons. There is also a relatively large

Figure 1. Percent of 208 weeks when cases of cholera were notified, by district,<sup>1</sup> East Pakistan, 1956-59



<sup>1</sup> No districts reported cases for 40-70 percent of the total weeks.

Figure 2. Rainfall in Dacca and deaths from cholera in East Pakistan, by week, 1959



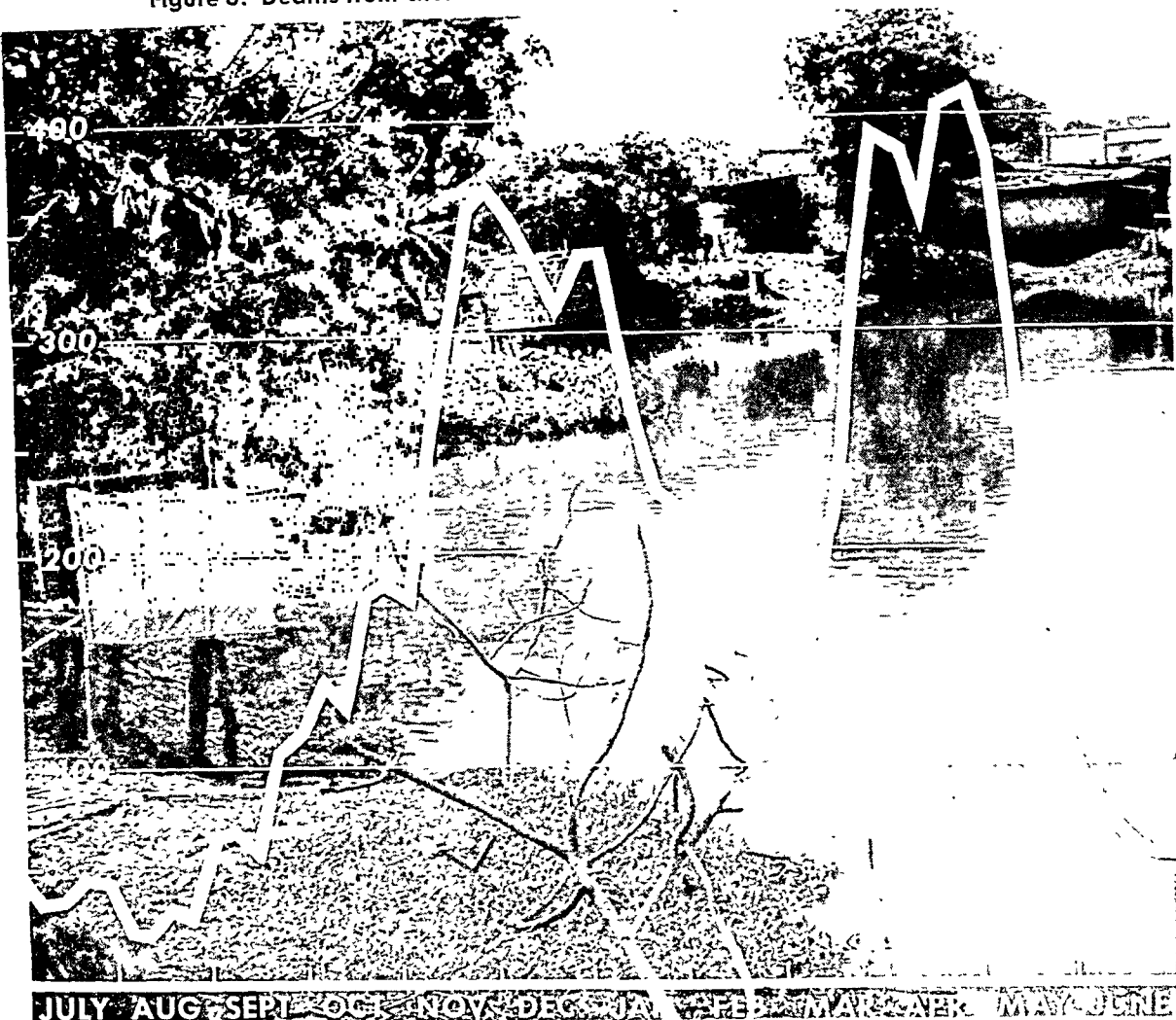
NOTE: The lag in case reporting of deaths may be as much as 2 weeks.

degree of isolation between the tiny communities since the women are in purdah and seldom leave the home, and most travel is on foot or by the slow-moving boat. Except for the tanks and the methods of excreta disposal, the hygiene of the communities is of a fairly high standard.

It was Koch who first suggested that the tanks might be the most important means of spread, and many other workers have agreed with him. When the whole population washes in the water used for drinking and cooking, there must be a communal sharing of intestinal organisms. Most communities have isolated and screened latrines, but sometimes these are perched on the edge of the tanks, so that the water is further polluted. Toward the end of the dry season in April and May the water has sunk to a low level and become stagnant and unpleasant. Beyond doubt the tank is the greatest means of spreading the cholera vibrio during the greater part of the year. However, it is not the only means. The factors of personal contact, flies, and infected food still play a part, if only a minor one, especially in the larger villages, the overcrowded and insanitary "old" towns of Dacca and Chittagong, and in the crowded trains and other public transport systems.

That the tanks are closely implicated in the spread of infection is indicated by the epidemiology of the infection in the endemic areas. There are two kinds of occurrences. In the

Figure 3. Deaths from cholera in East Pakistan, by month, 1954-59 average



Photographic background shows latrines perched on the edge of a tank.

first, only one or two persons, usually small children, become ill in a village; in the second, 20 or 30 persons acquire cholera within 1 or 2 days and then only a few more, indicating an explosive common-source infection. The former type of outbreak is probably expressive of the immunity status of the village, in which only the small children are still susceptible, while the latter can be explained best on the basis of some vehicle of spread common to everyone, such as the tank water.

Traditionally, the cholera seasons ends with the onset of the monsoon (fig. 2). The abatement of local epidemics whenever a heavy, unseasonable rainfall occurred in the dry season of 1958 has been described elsewhere (2).

The influence of temperature has been less well recognized. When deaths from cholera in East Pakistan are averaged over a 5-year period, a smaller cholera cycle during the winter months can be recognized in addition to the major cycle during the dry months (fig. 3). As the days grow shorter and colder, cholera diminishes, although there is some lag from the fall peak in November and December. Rainfall, sunshine, and temperature data are given in table 1. The peak periods for cholera are in the hot months of the year when there is no rain.

Two exceptional years in the past decade were 1953 and 1954. In 1953 the monsoon finished earlier than usual, the cholera season

started sooner, and the incidence was higher than normal. In 1954, flooding was extensive, largely due to unusually heavy flows down the Brahmaputra. Most of the delta was under water, some of it for as long as 3 months. During that time cholera was at a particularly low level for East Pakistan.

### Experimental Theory

There have been many attempts to explain the epidemiology of cholera by changes in the physical conditions of water, but so far none have been successful. There is no difficulty in finding the vibrio in the rivers around Calcutta or in places such as the tanks where religious washings take place, but the difficulty is in accounting for the relationship between the rainfall and temperature and the appearances of outbreaks, as well as the confinement of the endemic disease in so small an area.

The one feature that sets the vibrio apart from all other intestinal pathogens is its capability of thriving in media that are highly alkaline. The upper limits of resistance to pH do not seem to have been clearly defined, but the organism can multiply at a pH of 9.2 and probably survive for long periods at a much higher pH. Generally in biology, characteristics so marked as these are not due to chance, but are the results of intense natural selection pressures in the environment. It seemed to us that the water in the tanks might have alkalinities of a magnitude that would provide the necessary selection pressures and that the seasonal and geographic relationships of the disease could be accounted for by variations in the pH. Other workers have studied this matter, but they emphasized chiefly the river water and not the tanks, and no allowance was made for the biological activity of the algae in the water at different times of the day.

The tanks in Bengal contain so much algae that normally the water is a deep green color when it is not muddied. The concentration of algae and the rate of photosynthesis at any given time are the result of a highly complex interplay of many factors, but the major ones are the amount of organic and inorganic matter in the water and the amount of light available. Related to the photosynthesis, but not proportional

**Table 1. Length of day, sunshine, rainfall, and mean temperature, by month, Khulna, East Pakistan, 1959**

Month	Day length (hours)	Sunshine (hours)	Temperature <sup>1</sup> (degrees Fahrenheit)	Total rainfall (inches)
January-----	11. 00	9. 57	68	0. 4
February-----	11. 25	9. 34	74	1. 0
March-----	12. 00	8. 00	81	1. 3
April-----	12. 40	7. 55	86	3. 9
May-----	13. 10	7. 10	87	7. 4
June-----	13. 30	4. 43	85	12. 0
July-----	13. 25	4. 52	84	14. 4
August-----	12. 55	4. 01	84	13. 2
September-----	12. 20	4. 88	85	8. 4
October-----	11. 40	5. 70	82	5. 4
November-----	11. 05	8. 82	76	1. 0
December-----	10. 50	9. 03	70	. 1

<sup>1</sup> Highest recorded, 107° F., lowest recorded, 39° F.

SOURCE: Report on the Khulna Multipurpose Project, East Pakistan Water and Power Development Authority, 1959.

to it (3), is the respiration of water plants. Since the rate of photosynthesis is normally faster than the rate of respiration, in daylight these plants absorb carbon dioxide from and liberate oxygen into the water. At night the reverse process takes place. Also, photosynthesis is inhibited by too much sunlight (3). Beyond the optimum, the rate of activity falls rapidly, so that in bright light the maximum respiration of the algae will take place not at the surface of the water but deeper down, and in shallow surface water this factor might be of importance.

Since the endemic areas are closely linked to lands very little above sea level, and the vibrio is known to have a salt requirement, a brief exploratory study was made to see if the endemicity could be linked to the salinity of the water.

It is well known that the cholera vibrio does not live long in river water such as that of the Ganges and Nile or in sewage, and the usual explanation is that in such places it cannot cope with the competition of other organisms. In Bengal, if it could be shown that tank water has a high pH, the situation would be reversed, for intestinal organisms such as *Salmonella typhi* would soon die off (table 2), and the cholera vibrio would survive. Should testing of sur-

face waters in other parts of the world reveal different pH levels, an explanation would be provided for the limitation of the endemic area to small parts of Asia.

However, when heavy rain muddies and dilutes the tank water and the sky is overcast with thick clouds, the pH might not rise, and the cholera vibrio would then lose its advantage in survival. If such a situation could be shown to exist, then a reasonable explanation could be given for the well-known phenomenon of the disappearance of cholera during the monsoon.

Cholera diminishes regularly almost every year in the winter months when little or no rain falls (fig. 3). This dwindling of cases could possibly be caused by variations in the pH due to a drop in temperature, shorter days, and fewer hours of sunlight per unit of water surface area.

Collection of Samples

Therefore, it was decided in 1959 to test six tanks in the Motijheel area of Dacca for 1 year to see how the pH of their waters varied during changing climatic conditions and to attempt to correlate these changes with the general incidence of cholera.

The tanks were typical of those throughout the Province, except that people did not drink so much from them, since piped water was available. The people used all the tanks for washing clothes, ablutions, swimming, and fishing. Professional dhobies washed clothes in tanks 1 and 2; bullocks and buffaloes were often cleaned in tank 2; 3 had a latrine on one edge; and tanks 3, 4, 5, and 6 were close to houses whose drainage had access to the tanks. Tanks 1 and 2 were open to the sun from sunrise to sunset, while the others had a varying number of one- or two-storied houses or shacks and an occasional tree close to them. The tanks ranged in size from 50 by 100 yards to 100 by 200 yards and in depth from 4 to 18 feet.

Samples of water were usually collected from

the six tanks every Monday. The water was taken from the same spot every time and from about 6 inches under the surface. Most of the time, specimens were taken three times in the day, at 5:30 to 5:45 a.m., at 11:30 to 11:45 a.m., and at 3:30 to 3:45 p.m. In a series of more intensive investigations two of the tanks with the largest ranges of pH were sampled six times in the day at 2-hour intervals beginning at 5:30 a.m. During the summer, it was daylight at 5:30, but dark during the winter.

The 5:30 a.m. specimens were kept in the dark until the laboratory opened at 8:00 a.m.; the others were all tested within half an hour of collection. Attempts were made to test water outside Dacca, especially in the nonendemic areas. After sensitive paper proved unreliable in determining the pH, a portable pH meter was used to test water on a trip to the southern end of the endemic area.

Analytical Procedures

The analytical determinations were made in the Dacca laboratory of the Ralph M. Parsons Co., of Los Angeles, Calif., which, under an ICA contract, collects data needed for its design of water supply and sewage disposal systems for Dacca and Chittagong. This laboratory is equivalent in scope and equipment to public health laboratories in the United States. After completion of the contract, the laboratory will become the nucleus of the water and sewage section of the new public health laboratory for East Pakistan. The initial specimens were tested by Dr. Gordon E. Mau, and the later ones by Jack R. Snead, both of the Parsons firm.

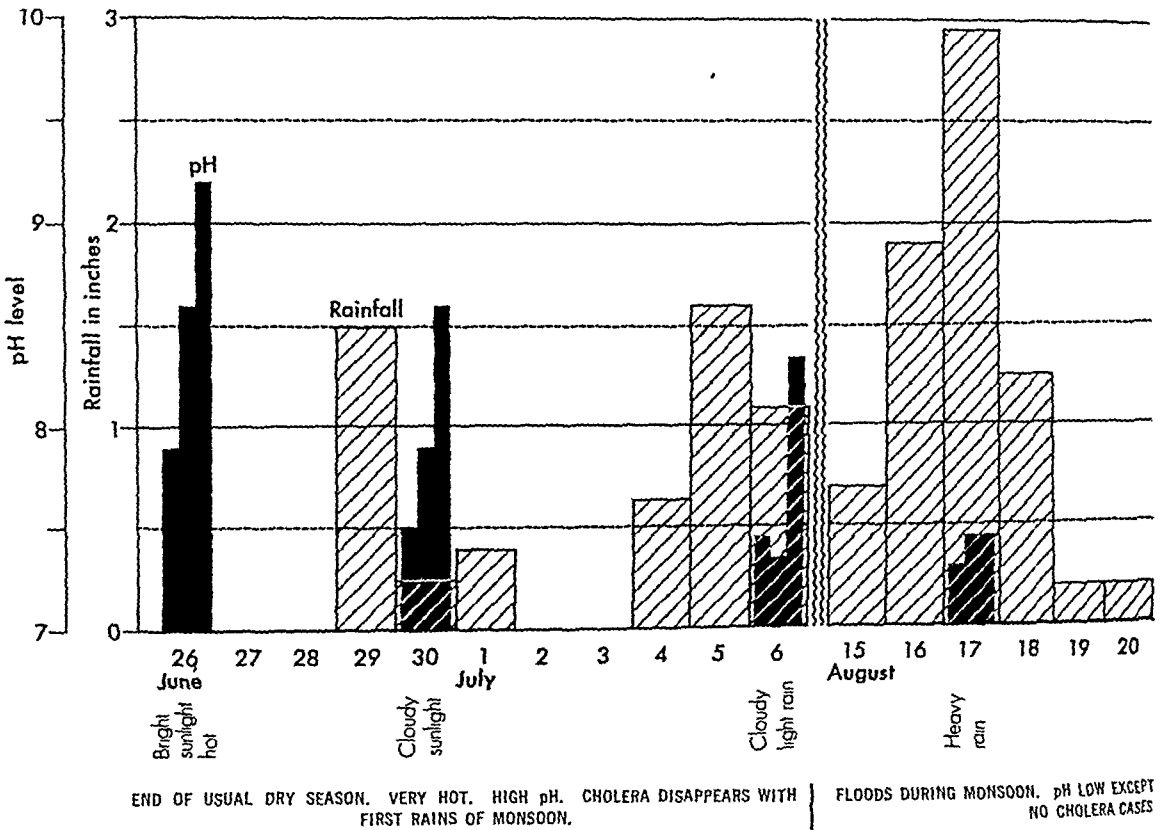
The procedures followed in this laboratory are those of the 10th edition of "Standard Methods for the Examination of Water, Sewage, and Industrial Waste." Precision and accuracy of analytical results are maintained by having each chemist periodically run a quantitative analysis of an unknown synthetic sample. Any errors reported are called to the attention

Table 2. Relationship of pH to the death rate of *Salmonella (Eberthella) typhi* at 20° C

pH	3.8	5.0	5.4	6.4	7.1	7.6	8.7	9.5
Half-life (hours)	0.28	23.0	27.0	21.0	6.8	2.7	1.4	1.0

SOURCE: Reference 4.

Figure 4. Average of the pH levels



of the analyst, and after the cause of the errors has been determined, the previously submitted data are either corrected or discarded. From these continuous checks, it is believed that the reported data are accurate to  $\pm 5$  percent of the reported values.

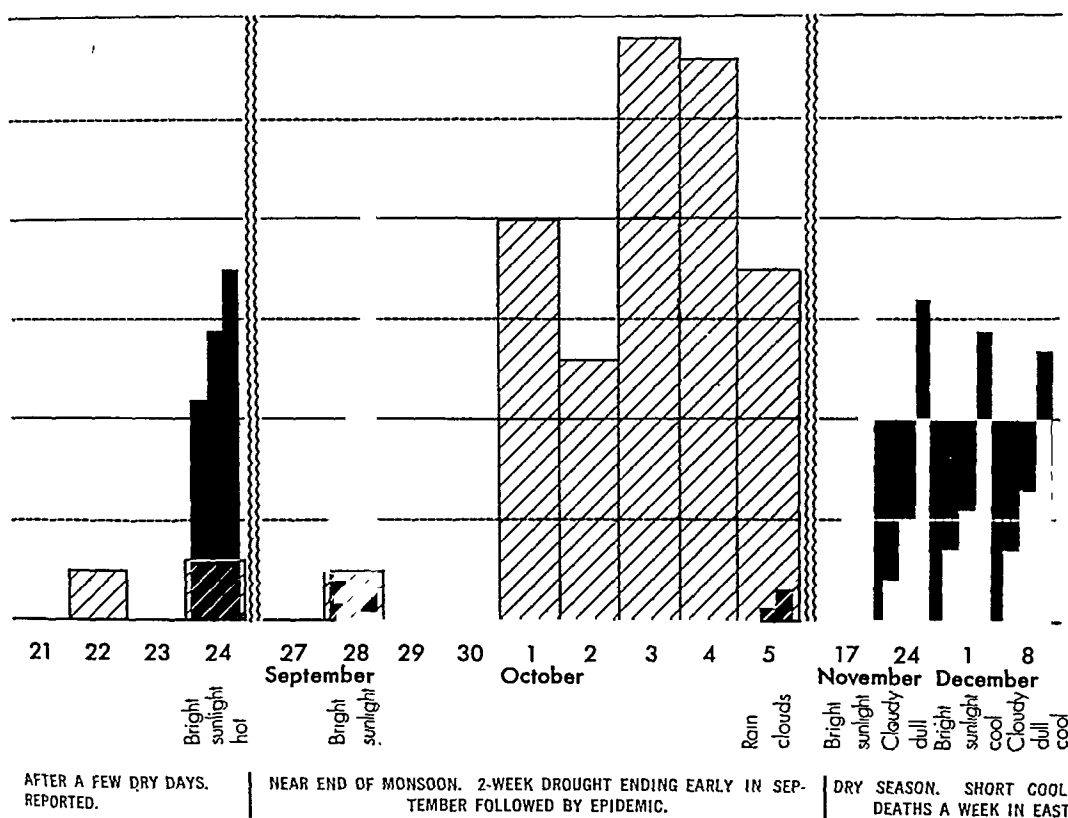
### Findings

The year 1959 was atypical so far as the weather was concerned. Normally, there is some light rain in January and severe wind storms with occasional rain in April, but in 1959 heavy showers occurred frequently between January and June. During the monsoon which was expected to start in June, there were often intervals of many days when no rain fell or only a little during the night. The apparent result of the unusual rains was that the anticipated epidemic peak of April and May did not materialize on the usual scale, while perhaps as a result of the light monsoon, the cholera started earlier and more heavily in September with

deaths reaching nearly 1,000 per week. The data are given in figure 2, which shows deaths for the whole Province but the rainfall only for Dacca. The abnormal rainfall also made more difficult the obtaining of clear-cut results with regard to the pH and its relation to sunlight and rainfall.

Samples of the relationship between the pH, the rainfall, sunlight, and time of day at four different periods of the year are given in figures 4 and 5. At sunrise, the pH is usually quite low, being either a little above or below 7.0, but on clear days with bright sunlight it is often above 9.0 by noon, and it can reach as high as 10.5 by late afternoon. A similar daily summer rise in the pH of a springfed pool with abundant *Chara fragilis* was observed in 1928 in the United States (5).

However, when the heavy rain, normal for the monsoon, falls either on the day of sampling or for some days before it, the pH does not rise much above 7.0 and on occasion may fall below it.



In winter, the pH still can rise to high levels but not quite so high as during dry spells in the hot weather. Also the number of hours when this happens is much shorter than in summer when there is no rain. During a long, hot, rainless summer day the pH is above 9.0 for at least 6 hours, but it is at that height for only 4 hours in winter (fig. 5).

Toward the end of the monsoon in 1959, a sharp epidemic of cholera occurred in Dacca District and in the city itself. It was reported to have started the week ending September 25, but when the time lag in case reporting, which can be as much as 2 weeks, and the incubation period of the disease are taken into account, the date when the population first became generally infected is advanced 2 or 3 weeks to about the beginning of September. This can be related to two comparatively dry, hot, and sunny weeks beginning on August 19, when the pH of the tank water was regularly at a high level for many hours a day. The sunny period was followed by heavy rains, including 5 inches on

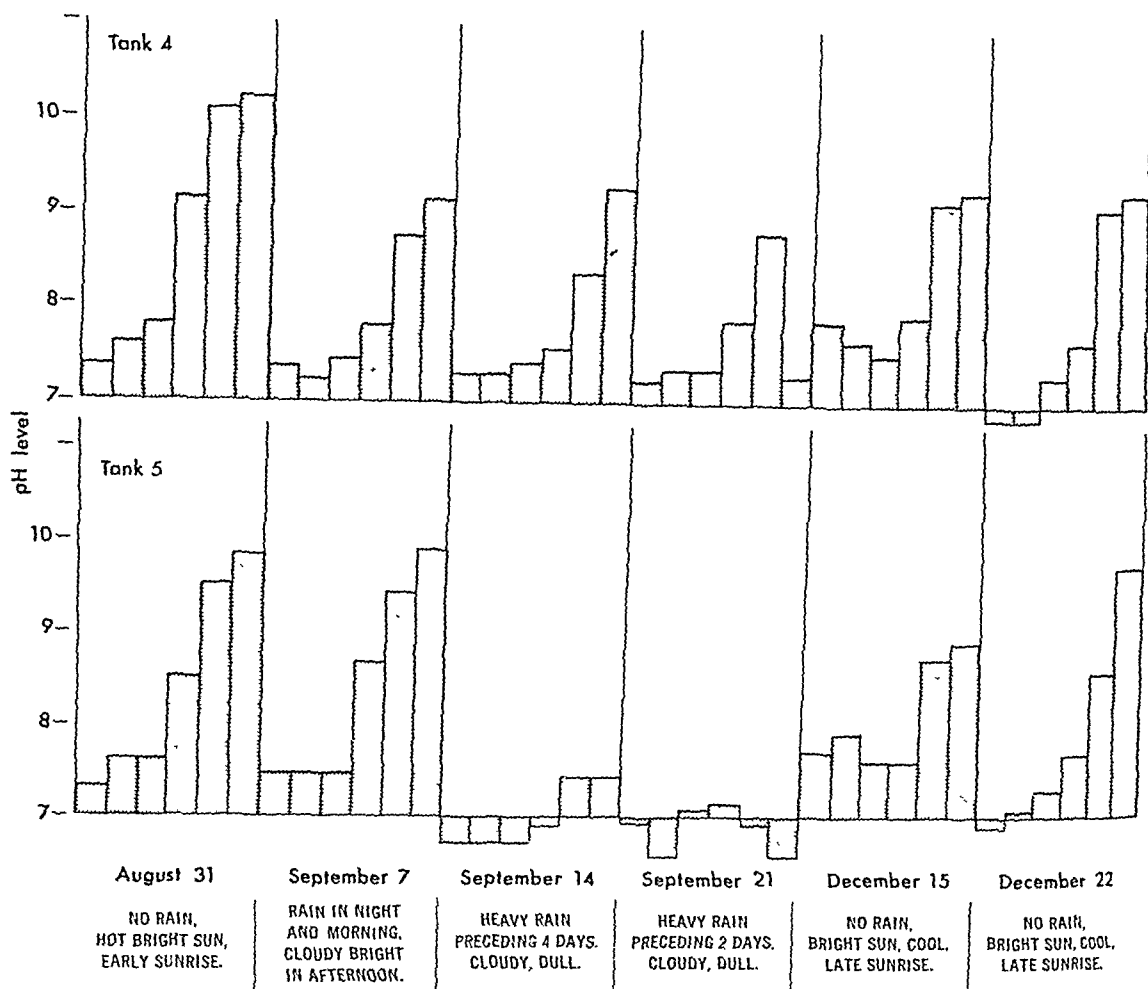
September 12, and when the water was tested on September 14, the pH was about 7.0 (fig. 5). The epidemic disappeared soon after, although sporadic cases at the rate of about five or six a day continued to be admitted to the hospital in Dacca.

Observations of tanks in other parts of the endemic area were not so complete as those in Dacca, but, in general, the findings were much the same. All tanks had abundant algae except one near the town of Khulna which did not show a rise in pH. In Khulna District many tanks were surrounded by trees and shaded for most of the day, and they showed little rise in pH above 8.0.

Estimates of chloride content of water showed no differences among the surface water near the sea at Barisal and Khulna, the study area at Dacca, and Rajshahi. In general the ranges were low, between 15 and 30 mg. per liter; tank 3 which had a latrine perched on one side consistently had a content of 50-60 mg. per liter. Other data on the chemistry of the tank water



Figure 5. Studies of the pH in tanks 4 and 5,<sup>1</sup> Dacca, East Pakistan, 1959



<sup>1</sup> Specimens collected at 2-hour intervals starting at 5:30 a.m.

in Dacca are given in table 3. The water is very lightly buffered so that relatively large shifts in the pH can be easily attained. The chloride levels are low, which could be of significance in view of the requirements of the vibrio in culture.

The turbidity is high compared with that of river water. In December when the testing was done there is little flow in the rivers, consequently little mud, and the turbidity is about 30. The difference in turbidity is due almost entirely to the fact that tank water is full of algae and river water is comparatively free of it, which would explain why earlier observers, who tested only river water, failed to find significant pH changes. During the monsoon the river

turbidity due to mud is more than 300. There is no evidence of gross pollution with sewage.

Because the rate of photosynthesis depends on the intensity of sunlight, the rate varies according to the season of the year and the degree of cloudiness. However, experience shows that local factors such as the muddiness of the water, the amount of shade provided by trees and buildings, and the cover provided by water plants on the surface have considerable influence on a particular tank. For example, in most tanks the pH dropped rapidly within half an hour after sunset, but the presence of a two-story house on the west side of a tank would be the equivalent of a half-hour advance in the

Table 3. Chemical analyses in milligrams per liter of tank water in Dacca, East Pakistan

Components analyzed	Tank number and date of sample					
	1 Dec. 28, 1959	2 Dec. 28, 1959	3 Jan. 5, 1960	4 Jan. 5, 1960	5 Jan. 11, 1960	6 Jan. 11, 1960
pH	7.40	7.40	7.25	7.20	7.12	8.05
Total dissolved solids	256	264	366	217	151	148
Turbidity	140	140	50	85	130	37
Total hardness as CaCO <sub>3</sub>	64	42	47	62	50	30
Total alkalinity as CaCO <sub>3</sub>	78	116	56	86	56	72
Ca <sup>++</sup>	16.0	9.6	9.6	15.2	14.4	8.0
Mg <sup>++</sup>	4.7	1.9	3.0	4.2	2.4	1.6
Na <sup>+</sup>	22.4	39.7	15.8	20.4	-----	28.0
K <sup>+</sup>	16.6	4.8	9.3	11.4	9.8	6.4
Fe <sup>+++</sup>	0.68	1.28	0.6	1.0	0.18	0.30
Mn <sup>+++</sup>	0.00	0.00	0.00	0.00	0.00	0.00
NH <sub>4</sub> <sup>+</sup>	0.17	0.03	0.008	0.08	0.05	0.23
CO <sub>3</sub> <sup>-</sup>	0.00	0.00	0.00	0.00	0.00	0.00
HCO <sub>3</sub> <sup>-</sup>	47.6	70.8	34.2	52.5	34.2	43.9
SO <sub>4</sub> <sup>-</sup>	1.8	0.8	11.0	13.0	11.4	11.6
Cl <sup>-</sup>	33.0	17.2	26.1	34.0	22.7	22.3
NO <sub>3</sub> <sup>-</sup>	0.16	0.05	0.42	0.22	0.44	0.44
NO <sub>2</sub> <sup>-</sup>	0.11	0.01	0.01	0.13	0.02	0.03
PO <sub>4</sub> <sup>=</sup>	0.05	0.04	0.02	0.06	0.34	0.12
F <sup>-</sup>	0.10	0.05	0.10	Tr.	0.15	0.10
SiO <sub>3</sub> <sup>-</sup>	27.2	19.2	7.6	12.1	18.9	13.6
BO <sub>2</sub> <sup>-</sup>	6.73	10.3	-----	-----	13.1	4.8

sunset and a shortening by that time period of the pH peak.

In the summer, the days are longer and the period of high pH is also longer. The sun is overhead so that each unit of water surface receives more light than in winter when the sun's rays hit the water at an angle. However, in a normal year the summer also largely coincides with the monsoon when rain reduces the number of sunny hours each day and muddies and dilutes the water in the tanks.

### Discussion

Cholera is a disease in retreat. After being spread over nearly all the world in the 19th century, it is now largely pinned down to a small and diminishing portion of southeast Asia. Even here, the trend in the incidence is decidedly downward, as indicated in the yearly figures for East Pakistan (2), and the shrinking of the area where the disease is found all year round. A few decades ago the endemic area included the Rajshahi District; now the area's northern boundary is about 50 miles south. However, cholera is still a serious potential threat to mankind. Deaths at a rate approach-

ing 1,000 a week are reported at certain seasons in East Pakistan, and developments such as fast jet plane travel or the chance of a war in the region might tip the balance once again in favor of the vibrio and result in major epidemics elsewhere. Therefore, it is of importance to know the factors which influence the infection in its original and perhaps only permanent home.

Most studies, even the most recent (6, 7), consider Calcutta to be the main focus of cholera. We suggest that in Bengal the endemic infection is primarily rural, and that the Calcutta urban region is of secondary importance. Many other cities in the world with large populations and overcrowding like Calcutta have experienced cholera epidemics, but in these always the infection has died out. London in the mid-19th century days of John Snow closely resembled Calcutta with its masses of people, insanitary slums, and cholera-infected river, but the vibrio failed to establish a permanent foothold. Calcutta has what the other cities do not have, a surrounding countryside in which cholera always exists.

Of course, the ecology of any infection is a highly complex affair. Variations in three main

factors, the host, the pathogen, and the environment, all must be taken into account. However, there must be something special to account for the persistence of cholera in Bengal when the infection dies out so easily elsewhere. The dominant factor cannot be merely bad hygiene or polluted river water, or the infection would have persisted in many other parts of the world. The investigations reported here were limited to the endemic area of Bengal, so that it is not possible to deduce from the data that the pH of the tank water alone is responsible for the localized endemicity. To test this possibility, similar studies would have to be undertaken in areas in which cholera has never been endemic. The data do allow concluding that the pH is a factor to be taken into account. They also permit theorizing that the pH is responsible for making the tanks the main means of spread of the vibrio and provide an explanation for the connection between the incidence of the disease and the changing climatic conditions.

One can even speculate that the infection evolved in Bengal because of this factor. It is well known that vibrios morphologically similar to the cholera vibrio abound in the water of this region, and it is easy to imagine that the population became parasitized with them through drinking this water. Indeed, a main difficulty in diagnosing sporadic cases of cholera here is that a certain percentage of the population are carriers of vibrios that look like the cholera vibrio but are said to be nonpathogenic. As the population of Bengal increased, especially after the founding of Calcutta, increased passage of these could produce a strain of vibrio pathogenic to man.

If further work should confirm that cholera is endemic in Bengal because of polluted tank water, then the answer to the problem of eradication of the infection lies in the provision of pure water for the villagers. The Government of East Pakistan, with the assistance of the United States through the International Cooperation Administration, is engaged in a program with a goal of 1 tubewell for every 400 people. About 120,000 wells are required. By the end of June 1960, 13,000 new wells were sunk and 12,000 choked-up wells rehabilitated, bringing the total of functioning wells in the Province to about 65,000. A similar program with

the same target, which was set by the Bhore Commission before the partition of India, is underway in the rural areas of West Bengal.

Because of the population distribution, even the achievement of this first target will not bring clean water to every villager. If cholera is to be eradicated, a special effort must be made, particularly in the endemic areas of Bengal on both sides of the border, to provide enough tubewells to reach everyone. International agencies that are interested in wiping out this disease should actively support these efforts of the local governments.

### Summary

A theory is presented to explain the long recognized connection between the incidence of cholera and changing weather conditions in Bengal. The theory is that in hot, dry weather algae in the village water tanks raise the pH of the water so high that the cholera vibrio is favored over other organisms.

The potentialities of these ponds of surface water which serve as the village water supply in spreading infection and the ability of the cholera vibrio to withstand a high pH have been noted.

Results of weekly tests of the pH of six tanks for a 1-year period and observations of the relationship of the pH to weather and to incidence indicate that the pH is a factor to be taken into account. It is suggested that the tanks are the chief means for spread of the vibrio and that the endemic infection is primarily rural rather than urban.

Cholera is endemic in Bengal, the major remaining focus of infection, because of polluted drinking water. The eradication of cholera from Bengal, and therefore from the world, depends largely on the success of the Pakistani and Indian Governments in replacing the village tanks with a source of safe water.

### REFERENCES

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- (2) Cockburn, T. A.: Epidemic crisis in East Pakistan, April-July 1958. Pub. Health Rep. 75: 26-36, January 1960.
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## Community Dental Health

Approximately 300 dentists in private practice in Hartford, Conn., were offered an orientation course in the broad concepts of public health and preventive dentistry through a series of lectures and discussions during 1959.

Six basic goals were the main objective of the sponsoring organizations, the Hartford Health Department, Hartford Dental Society, and the Greater Hartford Community Council. These goals were:

1. To acquaint dentists, engaged part time in community dental programs, with the meaning, significance, and goals of public health.
2. To develop the thinking of these clinicians along public health lines and thus aid and interest them in improving their respective programs.
3. To encourage higher standards of clinical dentistry, both in public institutions and in private practice.
4. To create an atmosphere which will encourage community responsibility and community participation in dental public health programs by other private dentists.
5. To promote the concept of preventive dentistry.
6. To aid in bridging the gap between private dental practice and community health programs.

Nine lectures were given by nationally recognized specialists between January and November at 2- to 4-week intervals, with the summer months unscheduled. The 10th meeting was a field trip to the Murry and Leonie Guggenheim Dental Clinic in New York City.

The planning group believed that Hartford dentists, untrained in public health yet giving their time and professional services in order to improve the health of the total community, would benefit from the program, which was made possible by a grant from the Hartford Foundation for Public Giving.

Meetings were held in an informal lounge area of the Hartford Medical Society building. An average lecture, with a social intermission at the halfway mark, lasted from 2 to 3 hours.

The speakers and their subject matter for this series are listed below:

Dimensions of Public Health: Edward G. McGavran, M.D., D.Sc., M.P.H., University of North Carolina.

Planning for Local Community Dental Programs: Carl L. Sebelius, D.D.S., M.P.H., Tennessee Department of Public Health.

Interceptive Orthodontics—Tooth Guidance: John F. Mortell, D.D.S., M.S., University of Michigan.

Methods, Materials, and Motivation in Dental Health Education: Perry Sandell, B.A., M.A., American Dental Association.

Meeting the Dental Needs of the Physically Handicapped and Mentally Retarded: Robert L. Fisher, D.D.S., Long Island College Hospital, and Albert Green, D.D.S., Columbia University.

Prevention and Control of Dental and Other Oral Diseases: Robert G. Kesel, D.D.S., M.S., University of Illinois.

More Effective Public Speaking, or Did They Understand What You Said? David C. Philips, M.A., Ph.D., University of Connecticut.

Oral Lesions in Infancy and Childhood: Joseph L. Bernier, M.S., D.D.S., Armed Forces Institute of Pathology.

X-ray Radiation and Its Significance: Leonard F. Menczer, D.D.S., M.P.H., Hartford Health Department.

Additional information, if desired, will be supplied upon request to Dr. Leonard F. Menczer, Hartford Health Department, Hartford, Conn.

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# Evaluation of Tuberculosis Casefinding by Mass Small Film Radiography

ANDREW C. FLECK, M.D., HERMAN E. HILLEBOE, M.D., and GEORGE E. SMITH, Jr., M.A.

**E**VALUATION, by definition, is the process of determining value. Value is a concept that expresses a relationship between expenditure and benefit. In a proposed or actual public health program, benefits are either stated or implied in documents submitted to appropriating bodies or budget directors as justification for expenditures.

There is no theoretical approach to evaluation; it is entirely an empirical process. To evaluate a proposed program and appraise its potential for good or ill, the evaluator has only the past experience of others with which to work. If a program is already operating, the evaluator can draw also from current experiences.

None may argue safely that a program's benefits are too intangible for measurement. Public health programs—indeed all human effort—are in constant danger of becoming pointless exercises in movement unless there is constantly available some method of accurately expressing the relationship of cost to benefit.

This paper reports the results of an evaluation of the radiographic survey tuberculosis casefinding program of the New York State Department of Health in upstate New York. The program was begun in 1948, but, because records for the years 1948–51 were not readily available, results for the years 1952–58 only have been used. To obtain maximum ob-

jectivity, this evaluation was made by the executive office of the health department and not by the program's operating staff.

## The Program

Two casefinding methods have been used since the start of the program in 1948, general community surveys and general hospital admissions.

### *General Community Surveys*

Community chest X-ray surveys are initiated by application of a full-time local health officer, who first determines the need for the survey and takes the necessary steps to organize the community. This preliminary work may or may not have the assistance of other official and voluntary agencies. The tuberculosis casefinding bureau of the State health department assigns priorities in the order in which applications for surveys are received.

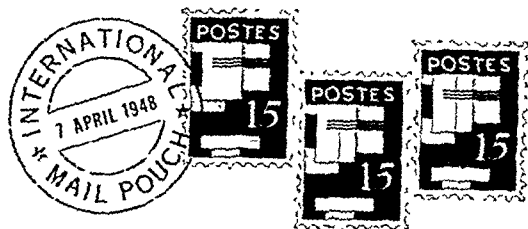
The casefinding bureau has seven transportable X-ray machines, which take miniature 70-mm. chest X-rays. The bureau provides films, chemicals, and special records. Films are interpreted by chest experts. Five of the machines are in mobile buses. Specially trained photo-fluorographers operate these units and process the film.

### *General Hospital Admissions*

The second casefinding method is the X-raying of all adults admitted to participating general hospitals. Any nonprofit general hospital with 4,000 or more admissions a year is eligible to enter this program. Ninety-six of the 187 eligible hospitals in upstate New York were

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*Dr. Fleck is evaluation consultant to the research, development, and evaluation group, New York State Department of Health, Albany. Dr. Hilleboe is commissioner of health, and Mr. Smith is senior examiner of methods and procedures, office of planning and procedure.*



## Farm Education Improves Public Diet

"For the past 20 years, The Rockefeller Foundation has been working with the Ministry of Agriculture and Animal Husbandry of Mexico. At a cost of something less than \$2 million per year, American agronomists have been supplied to Mexico, and young Mexicans have been trained in the agricultural sciences. In this period, the food production of the country has mounted 80 percent. The gains have been achieved by improved yields of Mexico's own staple crops, the development of new varieties of wheat and potatoes, and the establishment of something like our own county-agent system for farmer education. Not a single tractor or fertilizer plant is in the expense account: the money has been spent for the intangibles of information, education, and expert consultation. The 4 percent per annum gain safely exceeds the 3 percent increase in population and has brought an improvement in the people's diet that is already showing up in the vital statistics."

—From *"The Revolution in Man's Labor,"* a speech delivered by Gerard Piel, April 9, 1959, at St. John's College, Annapolis, Md.

## Health Education in Ghana

The health inspectors were chosen to spearhead education for health among the people of Ghana. Inservice courses for selected inspectors were held in each region. The Cocoa Marketing Board provided the funds for the health education project in the Northern Region.

Approximately 50 local health committees in the Eastern, Western, and Volta Regions have been formed as a result of the inspectors' work. The following excerpts from reports indicate the reactions and achievements in the villages.

The Suhum Health Education Committee organized a 1-day school on hygiene for palm wine sellers, chop barkeepers, bread sellers, and wine and

beer barkeepers. The committee has also put up with voluntary labor two urinals for patrons of some nearby palm wine bars. Members of the committee gave talks in schools and churches and at village gatherings.

The Diase Health Education Committee has a bilharzia education program in progress. People make less use of river water. Weeds on the outskirts of town have been cleared by the committee through communal labor.

The Bogoso School Health Committee conducted a group discussion on the health of the school child. A large number of parents were present. "Keep Bogoso Clean" was the theme for a health week with parents, teachers, and children participating in cleaning homes and the town.

Sakai, Tumu District, is a village of about 600. Its people have a reputation for their stubbornness, but they pledged full support to the health committee.

Pregnant women and children under 5 years were registered. Weekly child welfare clinics were started and have been heavily patronized. Bathing of children has become competitive.

The people weeded and swept the entire village and built 12 pit latrines. "The spirit of cooperation and self-help had strongly seized the hearts of every member of the village. . . ."

In Bongo, Bolgatanga District, we were able to form a women's health committee. The women meet every Monday to discuss matters of interest and have asked for more demonstrations about bathing the baby and the preparation of orange squash. The committee members divided themselves into groups, and they visit pregnant women and the sick to advise them to go to the hospital.

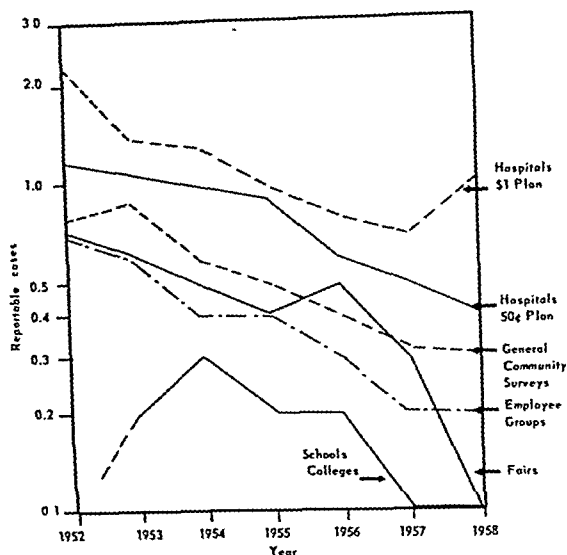
Before our arrival in Sekojega, Yendi District, there was not a single latrine. For this reason, we tackled the construction of pit latrines the second week. The people built seven pit latrines, which are fairly distributed over the village.

Most of the mothers have begun to give the babies boiled water and fruit juices. Most of them do not add eggs to kako, a type of porridge. The general reason given is lack of means.

The people feel the dire need for a dam; they have pledged to contribute manual labor to any scheme to materialize the construction of a dam.

—JEAN M. PINDER, health education adviser, U.S. Operations Mission, Ghana.

**Annual number of tuberculosis cases per 1,000 films taken in a mass X-ray survey in upstate New York, 1952-58**



is either more efficient than other methods or is the best method of finding a particular class of cases. Discovery of an unsuspected class of cases dictated the selection of mass radiography as a casefinding technique in upstate New York. Other methods of casefinding are directed at suspect persons who either are known to have been exposed to tuberculosis or show evidence of infection or disease.

### *Measurement Indices*

The ultimate objective of mass radiographic casefinding is to discover unknown potentially communicable cases of tuberculosis. Since tuberculosis is a communicable disease and one unknown case may spread the disease to many persons, it is desirable to discover all cases. In practice, however, results must justify effort in terms of total department funds available for all health services. For this reason, the number of cases found is, alone, an inadequate measure of the extent to which the objective is being attained. Results must therefore be measured in terms of cases found per unit of effort.

Before we could determine the number of cases found, it was necessary to define a "case." A case of tuberculosis found on mass survey was defined as one previously unreported and clinically diagnosed 6 months following X-ray as active, activity undetermined (probably ac-

tive), reportable pleural effusion, or active extrapulmonary tuberculosis. These terms are defined in Diagnostic Standards of the New York State Department of Health and are based on diagnostic standards and classification of tuberculosis promulgated by the National Tuberculosis Association, 1957.

When the evaluation started, only the initial screening film results were routinely reported to the State health department. These findings were classified as probably active, probably inactive, suspect tuberculosis, or negative. Preliminary casefinding yields reflected only the number of probably active cases (by X-ray film diagnosis only) per 1,000 films. Early in the evaluation it became apparent that this was not a valid measure of the number of previously unknown active or communicable cases of tuberculosis being found.

Using the clinical diagnosis established at the end of 6 months' followup as the standard for a true previously unknown active or communicable case of tuberculosis, the specificity of the initial finding "probably active" was found to be only 25 percent, and its sensitivity 53 percent (1). "Specificity" is a measure of the probability of a correct positive diagnosis; "sensitivity," of the probability of a correct negative diagnosis. In calculating the sensitivity index, it was assumed that there were no positives in the group classified as negative on initial screening. This, of course, is highly improbable (2). The specificity of initial findings varied from survey to survey.

Evaluation should serve as a tool to measure not only the extent to which the predetermined epidemiological objectives are being met, but also to the extent to which fiscal forecasts are being complied with. Therefore, a critical index of performance is the cost per unit of result "because programs all depend upon money for their continued operation" (3). The most successful casefinding plan will uncover the largest number of previously unknown cases of tuberculosis per unit of effort. One direct measure of effort is the number of dollars spent. Since budgeting is carried out in a dollar context, we selected as the index of effort expended the number of dollars spent by the official agency. We then related casefinding results to dollars spent. This method also provides a future basis



participating in the hospital survey program by the end of 1958.

The tuberculosis casefinding bureau loans photoroentgen equipment to hospitals for this activity. Each hospital submits routine chest X-ray reports to the bureau, which pays the hospital 50 cents for each report. Hospitals with less than 4,000 admissions a year may enter the program by agreeing to use their own equipment to take standard 14- by 17-inch X-ray films; these hospitals are paid \$1 for each report.

With both the community survey and general hospital methods, a clinical followup of initial findings is undertaken by the health department, and a "followup" diagnosis is submitted to the State health department by the hospital within 6 months after completion of the survey.

#### *Central Office X-ray Unit*

The bureau of tuberculosis casefinding supervises an X-ray unit located in the central office of the health department. This unit takes X-rays of newly hired State employees in Albany, develops all films taken by the mobile units, and performs other assigned tasks.

### **Evaluation Method**

The evaluation study was started by identifying the possible benefits and the epidemiological basis for the health department's tuberculosis program. These were either implied or stated in documents such as the existing program plan, budget justifications, and pertinent legislative enactments.

#### *Epidemiological Assumptions*

The mass survey method has utility as a screening device in a normal population only if the following assumptions are true:

- That pulmonary tuberculosis is frequently an unsuspected disease.
- That persons with unsuspected pulmonary tuberculosis constitute a hazard to themselves and an actual or potential hazard to others.
- That tuberculosis suspects found by radiographic screening of a population will receive followup diagnostic study so that true cases will be identified.

These assumptions were accepted by the eval-

uator. However, if the mass radiographic casefinding programs are found to be not productive, it may be because one or all of these assumptions are not true.

#### *Program Plan*

The program plan divides tuberculosis control into three activities: casefinding, isolation, and treatment. These activities derive from three epidemiological conclusions:

- Tuberculosis is an infectious disease caused by a specific agent, the tubercle bacillus.
- Tuberculosis is spread from person to person by exhalation of the specific agent by a person with pulmonary tuberculosis and inhalation of the agent by a susceptible person.
- The most effective control is achieved by containing tubercle bacilli in or eliminating them from persons with pulmonary disease.

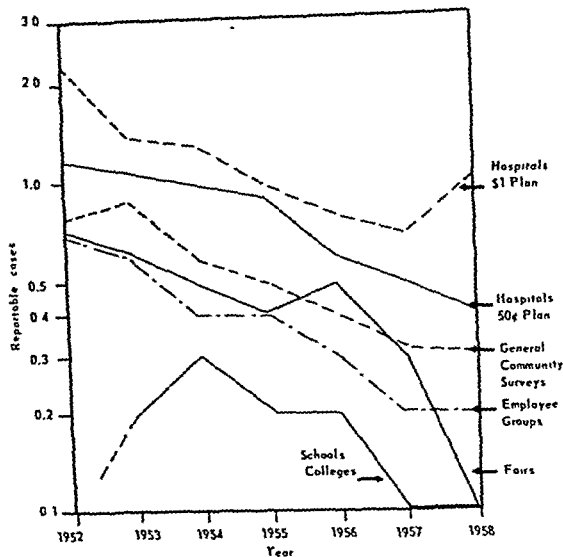
In this evaluation, we did not critically examine these conclusions but accepted them as being in accord with what is presently known about the epidemiology of tuberculosis. They may or may not be true. Each evaluation process must identify these fundamental conclusions so that they are available for review by the executive who is to use the study as a basis for making decisions.

#### *Program Objectives*

Epidemiologically, the objective of the tuberculosis casefinding program is the discovery of unreported potentially communicable cases of tuberculosis. This objective is so stated in the program plan. However, casefinding activity bestows no benefit unless the other elements of tuberculosis control— isolation and treatment— are satisfied. For this reason, the contribution of a casefinding activity to the ultimate goal of tuberculosis control cannot be evaluated by examination of the casefinding function alone. Nevertheless, the extent to which mass radiographic surveys contribute to the subordinate goal of casefinding can be determined and evaluated.

The establishment of a casefinding program requires that all casefinding methods in use be considered. When funds are short, the spending of money for mass radiographic surveys implies that other casefinding methods have been rejected. It also implies that the mass survey

**Annual number of tuberculosis cases per 1,000 films taken in a mass X-ray survey in upstate New York, 1952-58**



is either more efficient than other methods or is the best method of finding a particular class of cases. Discovery of an unsuspected class of cases dictated the selection of mass radiography as a casefinding technique in upstate New York. Other methods of casefinding are directed at suspect persons who either are known to have been exposed to tuberculosis or show evidence of infection or disease.

### *Measurement Indices*

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**Table 1. Yield of previously unknown cases of active tuberculosis and variable cost per case found, 1952-58**

Year	Number films taken	Active cases found		Variable cost	
		Number	Number per 1,000 films	Total	Per case
1952----	388, 012	454	1. 2	\$223, 332	\$492
1953----	388, 408	385	1. 0	227, 668	591
1954----	522, 914	414	. 8	239, 077	577
1955----	496, 144	345	. 7	258, 250	749
1956----	498, 256	260	. 5	264, 187	1, 016
1957----	519, 627	223	. 4	272, 304	1, 221
1958----	432, 241	187	. 4	269, 513	1, 441

for comparing tuberculosis casefinding performance with other governmental health activities.

Any method of calculating the cost of finding a new case of tuberculosis must provide information which will enable us to decide whether or not there is a proper balance between results and cost. This consideration applies both to the screening program as a whole and to individual surveys within that program. We, therefore, used a cost index which would show the yield of new cases found per 1,000 films.

The first step in calculating the cost index was to determine the annual variable, fixed, and total costs incurred in each casefinding method. The criteria for identifying fixed and variable costs have been described elsewhere (4).

Briefly, fixed costs are those which are unrelated to the volume of screening activity, such as equipment, and variable costs are those which reflect the volume of screening activity, such as X-ray film.

The second step in calculating the cost index was to determine the number of films taken in each survey, the total films taken during the year, and the corresponding numbers of newly discovered cases.

The computation was carried out by multiplying the number of films taken in a survey by the average variable cost of taking one film that year and dividing the product by the number of cases found by the survey being examined:

$$\text{Cost index} = \frac{\text{Number films} \times \text{average cost per film}}{\text{Number new cases found}}$$

### Results

Table 1 shows the number of previously unknown cases of tuberculosis found and the cost per case for each survey year. The number of cases found dropped from 454 in 1952 to 187 in 1958. During this 7-year period, the average variable cost of finding a previously unknown case increased from \$492 to \$1,441. This was primarily the result of declining yields, the variable cost factor being relatively stable.

Table 2 shows the annual variable cost—total and per X-ray—for the community and hospital admission survey programs for the period 1952-58.

**Table 2. Total variable costs and variable costs per film, mass radiographic survey program, upstate New York, 1952-58**

Year	General community surveys		Hospital admission surveys			
			Large hospital program		Small hospital program	
	Total variable cost	Variable cost per film	Total variable cost	Variable cost per film	Total variable cost	Variable cost per film
1952-----	\$94, 213	\$0. 53	\$110, 222	\$0. 50	\$18, 897	\$1. 00
1953-----	93, 147	. 63	106, 530	. 50	27, 991	1. 00
1954-----	93, 148	. 35	110, 894	. 50	35, 035	1. 00
1955-----	100, 856	. 45	116, 440	. 50	40, 955	1. 00
1956-----	103, 047	. 48	120, 612	. 50	40, 528	1. 00
1957-----	110, 421	. 47	120, 410	. 50	41, 473	1. 00
1958-----	117, 320	. 69	109, 741	. 50	42, 452	1. 00

The average cost figures masked considerable variations in performance; these became apparent when one type of survey was compared with the others.

Various specific rates were applied to delineate further the differences in results of the various types of surveys used in the program. However, specific rates were compiled for such factors as the "captive" or "voluntary" character of the groups screened, the population size of the incorporated area in which a survey was held, and the form of local health administration requesting and selecting the area to be

surveyed. This was done to determine whether any association could be found between the factors involved and higher casefinding yields. Such associations could then be translated into concrete administrative recommendations. However, the interpretation of such associations still requires that the facts be related to the whole theory of the natural history of the disease.

Table 3 and the chart present a summary of the findings classified by type of population surveyed.

Surveys of school and college groups have

**Table 3. Number of new cases of tuberculosis found, number per 1,000 X-ray films taken, and variable cost per case, by type of population screened, upstate New York mass radiographic casefinding program, 1952-58**

Year	General population			Agricultural fairs			Schools and colleges		
	Cases found		Cost per case	Cases found		Cost per case	Cases found		Cost per case
	Number	Rate per 1,000 films		Number	Rate per 1,000 films		Number	Rate per 1,000 films	
1952.....	110	0.8	\$663	6	0.7	\$745	0	0.0	(1)
1953.....	95	.9	741	4	.6	979	2	.2	\$4,161
1954.....	110	.6	610	6	.5	667	3	.3	1,308
1955.....	85	.5	915	4	.4	1,043	3	.2	1,881
1956.....	70	.4	1,279	4	.5	935	2	.2	3,090
1957.....	46	.3	1,359	2	.3	1,642	1	.1	5,943
1958.....	37	.3	2,189	1	.1	4,652	1	.1	6,552
Total.....	553	.5	939	27	.5	1,043	12	.2	3,275
	Employees			General hospital admissions					
				Large hospitals			Small hospitals		
	Cases found		Cost per case	Cases found		Cost per case	Cases found		Cost per case
	Number	Rate per 1,000 films		Number	Rate per 1,000 films		Number	Rate per 1,000 films	
1952.....	16	0.7	\$815	277	1.2	\$397	45	2.4	\$420
1953.....	10	.6	1,079	236	1.1	450	38	1.4	737
1954.....	22	.4	820	228	1.0	486	45	1.3	779
1955.....	11	.4	1,185	201	.9	579	41	1.0	1,000
1956.....	2	.3	1,856	149	.6	809	33	.8	1,228
1957.....	21	.2	1,837	129	.5	933	24	.6	1,728
1958.....	8	.2	3,118	99	.4	1,108	41	1.0	965
Total ..	90	.4	1,369	1,319	.8	602	267	1.1	926

<sup>1</sup> \$3,961 expended, no cases found.

**Table 4. Number of new cases of tuberculosis found and rate per 1,000 films taken in surveys of New York State employees, by place of employment, 1952-58**

Year	Place of employment					
	New York City			Upstate New York		
	Number films taken	Cases found		Number films taken	Cases found	
		Number	Rate per 1,000 films		Number	Rate per 1,000 films
1952				9,787	3	0.3
1953	8,924	13	1.4	7,313	2	.3
1954				270	1	3.7
1955				10,056	1	.1
1956	8,963	7	.8	2,545	0	.0
1957						
1958				10,276	0	.0
Total	17,887	20	1.1	40,247	7	0.2

been the least productive. In the 7 years of the survey, 79,076 films yielded only 12 new cases of tuberculosis at an average cost of \$3,275 per new case found.

Declining yields were obtained in surveys of the general population, agricultural fair goers, and employee groups. The 1958 cost of \$2,189 to \$4,652 for each case found in these groups suggests that more productive results could be obtained if greater care were taken in selecting

population groups to be surveyed. This statement has special significance wherever funds for tuberculosis control are limited.

Further exploration for high-yield subgroups within the school and fair populations is impossible because of the small size of the groups available for study and their relative homogeneity. As a consequence, when funds are limited further surveys of such populations must be labeled as unproductive.

The cost of finding a case of tuberculosis by surveying hospital admissions, employee groups, and general populations might be lowered if subgroups with higher yields could be identified. One promising clue to a high-yield group was uncovered when results of surveys of State employees located in New York City were compared with results of surveys of State employees in upstate urban areas. Table 4 shows that the yields in New York City were significantly higher, suggesting that the greater the degree of urbanization, the greater the yield of tuberculosis cases.

A similar analysis of surveys of other employee groups and general populations showed that higher yields are characteristic of both general and employee population surveys in incorporated areas of 80,000 or greater population (table 5). This higher yield was not the result of greater survey activity in urban areas in the earlier years when surveys were more productive, because the difference still exists in

**Table 5. Casefinding yields per 1,000 films in employee and general population surveys, upstate New York, by population of incorporated area, 1952-58 and 1957-58**

Population	1952-58 <sup>1</sup>						1957-58					
	General population			Employee groups			General population			Employee groups		
	Number films taken	Cases found		Number films taken	Cases found		Number films taken	Cases found		Number films taken	Cases found	
		Number	Rate per 1,000 films		Number	Rate per 1,000 films		Number	Rate per 1,000 films		Number	Rate per 1,000 films
80,000 and over	62,267	53	0.9	70,636	43	0.6	16,499	11	0.7	37,153	12	0.3
20,000-79,000	341,736	170	.5	56,756	15	.3	59,486	22	.4	29,796	4	.1
Under 20,000	644,901	330	.5	80,418	25	.3	176,287	50	.3	42,009	13	.3
Total	1,048,904	553	.5	207,810	83	.4	252,272	83	.3	108,958	29	.3

<sup>1</sup> Exclusive of State employee surveys.

**Table 6. Casefinding yields in three general hospitals with separate tuberculosis service, 1952-58**

Year	Number X-rays taken	Number cases found	Yield per 1,000 films
1952.....	24, 016	44	1. 8
1953.....	25, 482	51	2. 0
1954.....	24, 529	47	1. 9
1955.....	26, 372	66	2. 5
1956.....	26, 057	46	1. 8
1957.....	24, 478	46	1. 9
1958.....	21, 646	35	1. 6

the yield data for 1957-58. The yields are, however, lower in all population size classes, an effect of the yearly decrease in number of cases found. There was no observable difference in yield between the 20,000 to 79,000 population class and areas of less than 20,000 population (table 5).

The screening of hospital admissions showed the same association between population and yields of tuberculosis cases as analysis of re-

sults of surveys of other groups. Large hospitals located in incorporated areas of 80,000 or greater population gave consistently higher yields. Three hospitals in metropolitan areas gave sustained yields of 2 new cases per 1,000 X-rays. All three hospitals had wards devoted to the care of tuberculosis patients. Although screening films were not taken on persons admitted to the tuberculosis service, it was felt that there might be a tendency by physicians in these hospitals to admit tuberculosis suspects to the general wards. Therefore, these three hospitals were treated separately (table 6).

Table 7 shows the yields of tuberculosis cases for each population size class for hospitals participating in the program, exclusive of the three with tuberculosis wards. Casefinding was twice as productive in cities of 80,000 or over population as in areas with less than 20,000 population. The smaller hospitals, those participating in the \$1 reimbursement program, showed the same association between urban location and higher yield of cases (table 7).

Other factors explored were the type of local

**Table 7. Casefinding results for two hospital reimbursement programs, by population of incorporated area of hospital location**

Year	Population								
	80,000 and over			20,000-79,000			Under 20,000		
	Number films taken	Cases found		Number films taken	Cases found		Number films taken	Cases found	
		Number	Rate per 1,000 films		Number	Rate per 1,000 films		Number	Rate per 1,000 films
50-cent reimbursement program, 1952-58 <sup>1</sup>									
1952.....	120, 752	152	1. 3	40, 599	43	1. 1	35, 078	38	1. 9
1953.....	109, 167	122	1. 1	45, 596	29	. 6	32, 815	34	1. 0
1954.....	104, 780	103	1. 0	54, 166	42	. 8	38, 313	36	. 9
1955.....	115, 892	91	. 8	50, 997	31	. 6	39, 617	13	. 3
1956.....	115, 457	70	. 6	55, 520	12	. 2	44, 191	21	. 5
1957.....	115, 729	61	. 5	49, 417	11	. 2	51, 197	11	. 2
1958.....	101, 092	37	. 4	62, 596	19	. 3	34, 149	8	. 2
\$1 reimbursement program, 1957-58									
1957.....	3, 238	7	2. 2	18, 034	9	. 5	20, 201	8	. 4
1958.....	2, 900	9	3. 2	9, 635	5	. 5	26, 283	27	1. 0

<sup>1</sup> Does not include 3 general hospitals with specialized facilities for the care of pulmonary tuberculosis.

health organization initiating and planning the surveys, the frequency with which areas were surveyed, and the age distribution of the cases found. Only the last analysis provided information of administrative value. The existing policy arbitrarily called for the screening of all persons 15 years of age or older. Data from the hospital admission programs showed that X-ray films on persons over age 25 would be significantly more productive. In 1958 the yield of cases for males aged 15-24 was 0.2 per 1,000 (9,050 films) and for males aged 25-34 was 1.0 per 1,000 (11,510 films). The corresponding yield for females aged 15-24 was 0.1 per 1,000 (45,198 films), and for those aged 25-34, 0.3 per 1,000 (50,961 films).

### Use of Data by Administrator

The data on radiographic screening experience were collated to develop a system which could be used to predict the most worthwhile future activities in tuberculosis casefinding. Data were analyzed from a series of surveys similar to those which would ordinarily be contemplated for the future. These data provide a measure of the probability of finding cases of tuberculosis by each class of survey and can be used to predict trends and yields (5).

The trend data tell us that a continuation of the program in its present form will probably result in a casefinding yield of less than 0.3 cases per 1,000 films. Considered in the context of the dollar value of the mass X-ray screening system, such a prediction can be considered as an indication for discontinuance of much of the program. However, to make this decision, one must know how many cases can be found by some alternative method for an equivalent expenditure of funds. Such knowledge is not available as a result of this evaluation, and we cannot logically make such a decision (5).

The study also predicts that, if we confine our survey activity to incorporated areas of over 80,000 population and discontinue surveys of persons under age 25, school populations, and upstate State employees in all areas, the resulting higher yield will be about 0.5 cases per 1,000 population. The development and use of such a predicting system require regular re-

**Table 8. Percentage of unknown cases of tuberculosis found by various casefinding methods, upstate New York, 1958**

Method	New cases	
	Number	Percent of total cases
Hospital admission X-rays.....	140	7.0
Community surveys.....	47	2.4
Other methods.....	1,649	83.6
Reported at time of death.....	136	7.0
Total.....	1,972	100.0

porting of results and costs. By comparing our predictions with observed results we will be able to check the validity of the predicting system.

The results of the predicting system developed by the evaluation study were presented to the State health officer, who is responsible for making decisions. It was at this level that the evaluation process was completed.

The State health officer reviewed the theoretical basis for the program as stated in the report. He also considered the soundness of the view that tuberculosis is spread on an exogenous basis. He next considered the findings of the probability predicting system in view of his own individual value system. He gave the program operator full opportunity to discuss the results of the study and then made the following decisions, in accordance with the predicting system findings available at this particular time and place:

- Surveys of students, upstate State employees, persons residing in areas with less than 20,000 population, and persons under age 25 will be discontinued.

- Some photofluorographers and equipment no longer needed to carry on the program will be discontinued or shifted to other public health programs.

- Surveys in areas of over 80,000 population are to be intensified.

- A reporting system using valid measures of achievement will be inaugurated to measure future progress.

These decisions were wholly acceptable to the tuberculosis program directors.

The following decisions were made contrary

to the findings of the predicting system, presumably on the basis of other values foreign to the casefinding objective. The apparent reason for each decision is given in parentheses.

- Surveys of persons at the State fair will continue (for publicity purposes, not case-finding).

- School teachers will continue to be surveyed regardless of higher cost and because of legal responsibility (policy of the State education department that this be provided as a service).

- The central office X-ray equipment used primarily for the examination of upstate State employees is to be retained (equipment needed in part to process survey films and for demonstration and experimental purposes).

Just as the decisions made as a result of the evaluation study are influenced by other values, the interpretation of the evaluation results is influenced by other sources of pertinent information. The best illustration of this is the realization that the radiographic casefinding program uncovered only 187 cases of tuberculosis in 1958 at a cost of \$269,513. The total number of new cases of tuberculosis in the same year was 1,972. This means that the program being evaluated found less than 10 percent of the total cases. In comparison, 136 cases were reported for the first time at the time of death (table 8).

### Summary

Evaluation of a public health program requires that a predicting system be devised and made a continuing part of the program. The

application of such a system to a tuberculosis casefinding program in upstate New York produced the information that yields of cases found by mass X-ray surveys are low and will continue to decline.

No decision could be made on the basis of the dollar value of the mass X-ray screening system unless a similar study were made of all other casefinding methods. Adjustments were made within the program on the basis of the associative predictions and upon an unquantitated value system characteristic of the New York State Department of Health.

Less than 10 percent of all new cases of tuberculosis discovered in 1958 were found by the radiographic screening method at an average variable cost of \$1,441 per case found.

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## Smith Appointed Assistant Surgeon General

Dr. Clarence A. Smith became chief of the Communicable Disease Center, Atlanta, Ga., July 1, 1960, with the rank of Assistant Surgeon General. The deputy chief of the center since 1957, Dr. Smith succeeds Dr. R. J. Anderson, who has been appointed deputy chief of the Bureau of State Services, Public Health Service.

An officer in the commissioned corps of the Public Health Service since 1937, Dr. Smith became assistant chief and chief of the Service's Venereal Disease Control Division in Washington after serving as venereal disease control officer in Chicago.



# films

## Public Health Nursing In Communicable Disease Control

35-mm. filmstrip, color, silent, with printed guide, 49 frames, cleared for television, 1960. (Order No. F-417.)

Audience: Graduate nurses.

The role of the public health nurse in the control of communicable diseases is explained. Her activities and responsibilities to the patient, family, community, physician, public health agency, and to herself are depicted.

## How To Observe Nursing Activities

16-mm. filmograph, black and white, sound: part 1, 14 minutes, 12 seconds, 512 feet; part 2, 9 minutes, 43 seconds, 350 feet; 1960, cleared for television. (Order No. FG-315.)

Audience: Personnel in hospital nursing services and schools of nursing.



For use as an aid in planning nursing activity observation, this two-part film is based on and is to be used in conjunction with an accompanying manual "How to Observe Nursing Activities in a Patient Unit."

The film is divided for the convenience of the instructor in scheduling planning sessions. Part 1 describes a nursing activities study and explains how any nurse may be trained to observe these activities. Part 2 illustrates those services which are difficult to identify because their purpose is not apparent.

## Listeriosis

35-mm. filmstrip, color, silent, with printed guide and text, 45 frames, 1960, not cleared for television. (Order No. F-399.)

Audience: Physicians, veterinarians, and medical bacteriologists.

This filmstrip is a resume of the diagnostic characteristics of listeriosis from a clinical and bacteriological viewpoint. The text includes a description of the ecology and therapy of the disease in man and animals.

## Biology and Control of Domestic Mosquitoes

16-mm. motion picture, color, sound, 21 minutes, 782 feet, cleared for television, 1960. (Order No. M-357.)

Audience: Public health personnel engaged in vector control, students of public health, municipal and local public health officials, civic and service groups, and television audiences.



This film is designed to train public health personnel and students as well as to induce the cooperation of individuals and organized groups of persons in the control of domestic mosquitoes.

## Techniques of Laboratory Diagnosis of Influenza

16-mm. motion picture, black and white, 17 minutes, 600 feet, 1960, cleared for television. (Order No. M-368.)

Audience: Laboratory technicians.

A revision of "The Laboratory Diagnosis of Influenza," this film explains and demonstrates the procedures step by step which are now recommended for the laboratory diagnosis of influenza. Included are the collection of specimens, isolation

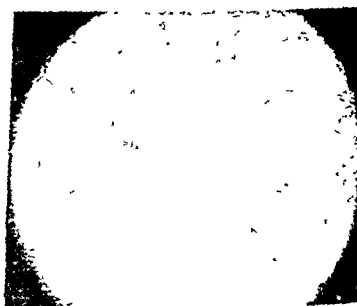


of the virus by intra-amniotic inoculation of chick embryos, rough agglutination tests, titration, hemagglutination tests, and establishment of antibody content.

## Introduction to Tissue Culture Techniques

35-mm. filmstrip, color, sound, 51 frames, 8 minutes, cleared for television, 1960. (Order No. F-388.)

Audience: Laboratory directors and advanced laboratory technicians.



An introduction to laboratory practice in the techniques, this filmstrip demonstrates, step by step, the procedures in producing and maintaining a tissue culture, using monkey kidney tissue as an example. The uses of tissue culture are summarized briefly.

These films are available on short-term loan, United States only, from the Communicable Disease Center, Atlanta 22, Ga., Attention: Audiovisual. They can be purchased from United World Films, Inc., 1445 Park Avenue, New York 29, N.Y.

## MICROBIOLOGICAL STANDARDS FOR FOODS

Microbiological testing for pathogens and indicator micro-organisms in food, in the factory, on the farm, or at the market, is only one phase of the process of preventing food poisoning. Useful and important in themselves, tests for microbial content of foods are futile if they are not accompanied by sanitation, adequate reporting and investigation, and public education. Microbiological standards for food, be they official, voluntary, or administrative, have been effective in promoting sanitation in many phases of the food industry. Nevertheless, there is a need for research, aimed at especially suspect foods, directed to specific organisms, processes, and stages of production, so as to develop defensible, attainable, and desirable standards, testing methods, and tolerances under authoritative auspices, as a guide to industry and as a protection for the consumer.

• • •

These comments were typical of the statements expressed by distinguished scientists, representing research institutions, regulatory agencies, and food industries of North America and Europe, at a conference on microbiological standards for foods, June 8-9, 1960, Washington, D.C., called by the Division of Medical Sciences of the National Academy of Sciences-National Research Council. The division's committee on sanitary engineering and environment joined forces with its committee on medical microbiology to organize the meeting, under the chairmanship of Prof. Walter D. Tiedeman,

resident lecturer at the University of Michigan, in association with Dr. Morris Shiffman, Department of Public Health, Philadelphia.

The conferees unanimously recommended that the NAS-NRC explore ways and means of furthering objectives on which the session was agreed.

The conference addressed itself to five questions posed by the chairman:

1. Are microbiological standards for foods necessary and desirable?
2. To what classes of food products should standards be applied?
3. What microbiological tests are applicable to foods?
4. How should limits be determined?
5. What practical results may be expected from the application of reasonable microbiological standards?

Along with the discussion of these issues, the conferees heard and participated in a series of auxiliary discussions so comprehensive that some excursion into questions of nutrition, palatability, spoilage, and chemical contamination was unavoidable.

### *The Issues*

1. The necessity and desirability of microbiological standards proved to be beyond debate. It was agreed that some standards of microbiological quality are always implicit. It was agreed that explicit standards generally have

had desirable effects, although specific standards are not always appropriate.

To develop and define standard limits, methods, and procedures, all considered to be desirable, the conferees urged considerable further education, study, and experience. They asserted there is an obvious need to build upon current standards. Food plant inspection was agreed to be a necessary and important phase of administering standards.

2. Classification of food products for application of standards was found to depend on a variety of factors. The ingredients and method of preparation, according to one system of classification, would emphasize the possibilities of contamination. Another factor in classification is experience with foods which have demonstrated a considerable hazard and which are amenable to regulation. It was agreed that an obligation rested with regulatory authorities to deal with immediate and obvious challenges presented by experience. The discussion brought out that few foods are completely secure from hazards in all circumstances.

3. The most earnest discussion as to the selection of microbiological tests concerned use of the coliform count. The experience of New York City suggested that this test was not any more effective as an indicator of contamination than the standard plate count, when such counts were high. Others proposed that a test for *Escherichia coli* be applied, as a more certain indicator of the presence and growth of enteric pathogens, when standard plate counts are low.

A single standard test for all foods had no champions. Although the standard plate count was agreed to have practical value as a measure of microbiological growth, it was agreed that the variety of foods, sampling methods, processes, and flora, and the possible presence of toxins without organisms, required a selection of tests and standards appropriate to the hazards.

4. The conferees discussed methods of determining limits as a critical challenge. Arbitrary official limits, while effective, were felt by several to pose an occasionally unreasonable threat to commerce. The zero requirements for coliforms in frozen foods was asserted to be impractical. It was agreed that there was far too little epidemiological knowledge at present on which

to base precise limits in all circumstances. By implication, empirical limits, set administratively rather than legally, with the support of continuing studies, seemed to be a favored course. It was suggested also that limits be based on the numbers and types of microorganisms attainable under good practice.

Numerical rather than qualitative standards, as a desirable proposition, had no opposition. The practical difficulties were found to lie in determining what quantity of growth is hazardous or indicative of improper storage or preparation in a given test or situation. There is also the need to determine quantitatively the presence of specific pathogens such as staphylococci and salmonellae. A further consideration was the current lack of sufficient personnel and laboratories to perform as many tests as might seem statistically necessary.

5. The immediate practical achievement of the conference was to agree on the need to seek support through the NAS-NRC, and its working committees, for continuing and expanding efforts to develop and apply standards. The practical value of such standards were believed to be foreshadowed by past achievements. However, none felt that microbiological standards by themselves would suffice to protect consumers from infection, poison, or spoilage. The gains in public protection, it was agreed, would require further advances in the knowledge and practice of sanitation by professionals and technicians, commercial interests, and consumers. There was no issue between realists and perfectionists: all accepted the virtue of directing attention toward specific situations where microbiological standards seem most likely to improve the safety and quality of mass-market foods.

None of the questions posed was solved specifically or absolutely. For such answers, the conference looked forward to specific studies.

## Conferees' Comments

Dr. Robert F. Korn, deputy health commissioner of New York, reminded the conference that in these days of mass production and international distribution, with long-term refrigerated storage, the classical point-source outbreak of food poisoning is no longer typical.

Instead, the epidemiologist confronts individual illnesses with no common location or period, even though they have a common source. For example, he cited a collection of cases of typhoid fever, identified as type E1, which occurred chiefly in adolescent males in half a dozen States, with 11 in New York alone. Although candy was suspected, the best efforts of a crew of epidemiologists failed to identify the source.

Other complications in the use of microbiological tests, Korns mentioned, were the presence of toxins without viable organisms, as in the staphylococcal enterotoxin which occurred in dry powdered milk in Puerto Rico, the possible viability of viruses or rickettsia in animal food products, and the presence of carcinogenic or toxic chemicals. He also observed that while foods may characteristically produce a high plate count, it is advisable to relate the application of microbiological standards to those foods and situations known to produce significant amounts of disease rather than to apply such measures routinely to all classes of foods. He expressed a faint hope that improvements in surveillance and reporting would strengthen the case for specific microbiological standards.

In this same precautionary vein, Dr. L. Joe Berry, speaking for the Committee on Medical Microbiology, mentioned the phenomenon of mixed infections, citing experiments in which germ-free animals resisted infection by *Entamoeba histolytica* until they were also exposed to *Escherichia coli*. He also cited a reversed relationship, reported by Schaedler and Dubos to the Society of American Bacteriologists in May 1960, in which pathogen-free mice were found more susceptible than standard Swiss mice to *Mycobacterium tuberculosis*, *Klebsiella pneumoniae*, and *Staphylococcus aureus* until inoculated with a specific strain of *E. coli* from the intestines of the Swiss mice.

Allowing for all such limitations and a few more, Dr. D. A. A. Mossel, Central Institute for Nutrition and Food Research, Utrecht, The Netherlands, asserted that microbiological tests have demonstrated their value in several respects, as a supplement to education, sanitation, and inspection. He cited microbiological studies which found pathogens in raw foods which would otherwise have been unsuspected and undetected. Other uses of the tests, he

noted, are to provide a check upon careless, erratic, or too congenial inspections; to offer final evidence that a given process is adequate and proper; and to establish goals for the improvement of sanitation in food.

Mossel urged, however, that standards of tolerance be specifically adapted to each separate food in a realistic way, that they be expressed numerically, that they pertain to specific organisms, using valid nomenclature, and that they be accompanied at all times by satisfactory standard methods of examination.

Speaking on the kinds of foods which might be subject to microbiological standards, Dr. Glenn G. Slocum, Food and Drug Administration, cited Thatcher's listing of such factors as the nature of foods; the method of processing, handling, and distribution; the opportunity for contamination, multiplication, or toxin formation; and the antimicrobial treatment, such as cooking. These factors, he said, focus attention on nonsterile foods consumed without adequate treatment.

Specifically, he mentioned foods which embrace all the factors: cream-filled or custard-filled bakery products, high protein foods, egg and potato salads, and products widely distributed for sale "more or less" under refrigeration. At the same time, he observed that the very perishability of such products limits the value of tolerance standards in removing them from the market, although the microbiological tests, he said, would lead to correction of errors in the chain of distribution. Frozen and dehydrated foods combine most of the factors except that opportunity for growth of microorganisms is limited by the means of preservation and distribution.

He expressed less concern with fresh or raw foods and canned foods as general classes, but in each category he cited specific instances in which apparent hazards might be decreased through microbiological studies.

Slocum emphasized, however, that neither he nor the Food and Drug Administration specifically advocates microbiological standards for any class of foods at this time. As he observed in his opening remarks, his agency is already vested by law with responsibility for protecting the public from food which contains a poisonous or deleterious substance, which is filthy or de-

composed, or which is prepared, packed, or held under insanitary conditions.

In the discussion, there was general agreement with a view, expressed by Dr. F. S. Thatcher, Department of National Health and Welfare, Canada, that efforts to develop standards should be directed primarily to situations which give evidence of the need and which offer an opportunity for practical achievement.

With respect to prevention, while it was conceded that a factory may supply food free of contamination, it was agreed that recontamination is not unusual if not inevitable under common circumstances, such as those cited by Col. John Rizzolo, Armed Forces Epidemiological Board, in reference to experiences of expeditionary forces in places where sanitation is unknown.

As to methods of determining microbiological standards for food, Prof. Aage Jepsen, Royal Veterinary and Agricultural College, Denmark, recommended a balance between the desirable and attainable. Emphasizing that foods must be appraised according to their specific nature and use, he described four categories, each requiring different consideration. High-temperature heat-treated hermetically packed foods, such as canned meats, being moist and lacking inhibitors such as salt, he said, may be vulnerable to microbial growth. Cultures from pre-incubated samples of such foods, he suggested, should prove sterile or yield only a scanty growth of organisms incapable of multiplication in the container.

Low-temperature heat-treated hermetically packed foods, such as cured hams, he said, containing salt and nitrite, allow only a restricted growth of salt-tolerant organisms. In these conditions, he said, gram-negative rods, fungi, and clostridia should be absent, and fecal streptococci and lactobacilli if present at all should be insignificant. The total count of aerobic organisms, he suggested, should be less than 10,000/gm., usually much less.

Low-temperature heat-treated nonhermetically packed foods, he noted, may be subject to recontamination, and standards of tolerance would be related to the probability of recontamination and the subsequent methods of storage and processing. In any event, he recommended that salmonellae should be absent.

Non-heat-treated salted or chemically preserved foods, such as anchovies, he said, carry a microbial population whose total numbers bear little relation to keeping quality. However, he thought it might be useful to test them for pathogenic or toxigenic organisms.

Fresh or raw frozen foods, he said, develop a bacterial count which may be related to temperature as well as to storage; but whatever the cause, a heavy microbial load in perishable foods indicates spoilage. He suggested raw frozen foods and raw shellfish as candidates for standards similar to those suitable for low-temperature heat-treated nonhermetically packed foods.

Speaking to the adequacy of microbiological standards as indicators of the sanitary conditions of food processing, Thatcher emphasized that the chief hazard of contamination is associated with the food handler, in the factory as well as in the kitchen, but he also mentioned defective design, construction, or maintenance of equipment or plant, direct contamination by rodents or insects, time-temperature factors in processing, and the quality of water used in the plant.

Although Canada uses the standard plate count, fecal indicators, and staphylococci tests chiefly as a check on plant sanitation, Thatcher recommended that the test for *E. coli* be favored as more likely to demonstrate the presence of fecal organisms, including enteric viruses. Because of their ubiquity, he questioned the merit of a zero requirement for staphylococci, but said he was ready to revise his views if foods become a vehicle for antibiotic-resistant strains of a virulent type.

Thatcher suggested that the standard plate count itself might serve as an indicator of defects in the chain of food production but indicated that he would also like to see a rapid and efficient method for detecting salmonellae.

The value of microbiological standards in promoting sanitary conditions in industrial food products, he stated, has been demonstrated not only with dairy products but with gelatin, bone meal, raw oysters, and crabmeat. While frozen foods have improved considerably in the absence of specific standards, he felt that the industry was spurred by the prospect of standards, as well as by its business interest.

While he did not imply that tolerance standards automatically guarantee safety in food, he said the presumption of safety favors foods that meet such standards. Also he noted that microbiological standards tend to encourage the selection of high-grade raw materials and their careful management. The coding of food lots, he observed, helps to isolate and recover foods found by microbiological examination to be dangerous. The opportunities for collaboration between the regulators and the regulated, he suggested, warrant earnest study.

In a program of action outlined for industry and government, Thatcher included factfinding and education in relation to new foods; standards for familiar foods offering experience with hazards or spoilage; development of industrial codes; enforcement of standards; education of food handlers, including transport workers, restaurant managers, and housewives; and development by industrial associations of mobile teams of "troubleshooters."

The tests which are favored, and their limitations, were discussed by Dr. Harry E. Goresline, Quartermaster Food and Container Institute for the Armed Forces, who, like Mossel, put special emphasis on the standardization of methods of examination, as essential to standards of tolerance. He also asserted that standards of operation in the food industry, determined by surveys of actual practices, should be no less important than standards of microbiological quality.

With respect to the former point, he cited studies which demonstrated the wide range of bacterial counts that resulted from slight differences in temperatures, media (presumably identical), sampling, or procedure. Before determining microbiological tolerances, therefore, he asserted that it is desirable to obtain data collected by standardized procedures. The next step he recommended was to limit requirements of the standards to attributes necessary for control and to microbes of true significance. Third, he proposed universal adherence to standard methodology, from sampling to reporting. Finally, he suggested that a range of counts, rather than a specific maximum, would be best for tolerance limits, except for certain pathogens which should be kept to the lowest level possible, in proportion to the hazard.

Specifically, he urged consideration of the "Recommended Methods for the Microbiological Examination of Foods," published by the American Public Health Association, as a step toward establishment and acceptance of standards methods.

Conceding that standards seem a worrisome burden to some and a necessity to others, he believed a meeting of the minds was possible.

With regard to the relation between microbiological standards and component product control, Dr. Millard Gunderson, associate director of bacteriological research for Campbell Foods, devoted his statement mainly to the special characteristics of frozen foods which, it was generally agreed, have in general improved in sanitary quality in the past 10 years in the absence of specific standards. The industry, he said, finds fewer public health hazards in the microbial population of frozen foods than threats of waste or spoilage. Each package, he said, is a micro-climate which, in fluctuating temperatures, may develop growths of mold. Having given attention to the proper selection, storing, and processing of frozen foods, he said, it is still necessary to follow through to assure storage at zero temperatures by the vendor and the consumer. As evidence of the effectiveness of sanitary controls, he offered data indicating the range of and average microbial counts in frozen food samples taken from retailers. He emphasized that biological tests serve mainly, after the fact, to assure the operator that sanitation processes are adequate. Under practical working conditions, he indicated it was difficult to pinpoint variations in the line which might produce sporadic samples with high microbial counts.

Dr. G. M. Dack, University of Chicago, opened with the statement: "No simple microbiological standards can be applied to all classes of food. In the application of microbiological standards, careful thought should be given to the quality of the raw ingredients entering the product, how the product is made and packaged, and conditions of time and temperature of storage from the time of production to the time it reaches the consumer. Of importance is whether the end product, in any stage of processing, provides conditions for the multiplication of food poisoning micro-organisms."

He proceeded to draw upon his experience with a number of foods to illustrate the variety of conditions for the multiplication of food poisoning organisms. He noted that when heating destroys the competitors of *Clostridium botulinum* in cheese spreads, the organism may grow and emit toxin. A similar possibility was found in connection with canned hams, but as 5 million canned hams have been sold with no case of botulism, the hazard apparently does not exist in American packing houses.

Dack attributed outbreaks due to staphylococcal enterotoxin in part to the fact that the enterotoxin is resistant to the usual heat treatments. No such hazard is found in precooked frozen foods because they are cooked at 350° F. for 40 minutes before serving. The main source of such food poisoning, he said, is the food handler with pyogenic lesions, where contamination is followed by time and temperature sufficient to build up toxin. It takes millions of staphylococci, he said, to produce enough toxin to cause illness.

Protection from salmonellae in poultry and meat products, he said, is provided as a rule by the fact that the products are cooked before serving. However, Dack mentioned that one of the possibilities in the dissemination of salmonellosis is the widespread use of frozen and dried eggs in food processing in this country. For example, in an angel food cake mix, picked up in the markets in January 1960, 15,000 *Salmonella montevideo* organisms were recovered per gram of the egg white mix in the product. Since this egg white powder is diluted approximately 1:3 with sugar, this would represent approximately 50,000 *S. montevideo* per gram of the dried egg. Products of this sort may have sufficient salmonellae to cause illnesses in children eating cake batter prior to baking. A suggestive example was an outbreak of *Salmonella reading* infection, involving 325 widely distributed cases, mostly in small children. The source of this outbreak, however, was not established. The cake mix manufacturers were apprised of this condition, and they have placed microbial specifications on dried egg white. With these self-imposed standards by industry, salmonellosis hazards are reduced.

During the discussion, Jepsen observed that heating liquid egg white to 56° C. for 3 minutes

appeared to be effective, even if all salmonellae were not destroyed.

Dack also mentioned the hazard of *Bacillus cereus*, a soil organism natural to cereal products, which was responsible for a large number of illnesses in Norway among those who ate a commercial vanilla pudding. After cooking, it had been left at a warm temperature for several hours, permitting surviving spores to grow.

In conclusion, he recommended labels give specific directions for refrigeration and cooking, to reduce hazards of food poisoning.

Dr. Leon Buchbinder, New York City Health Department, referring to the value of microbiological standards in improving the safety of water and milk, noted that the plate count standard for milk had been reduced from 500,000/ml. in the 1900's to 30,000/ml. currently. However, he pointed out that milk and water management are distinguished from foods in general by relatively closed processing and distribution systems and a limited number of processing plants and channels of distribution. Food management is handicapped further, he added, by the ubiquity of organisms that cause food poisoning, apathy of most of those who should be concerned, and the apparent assumption by many health authorities that food poisoning is well controlled.

He offered as a guess the estimate that there are 500,000 cases of food poisoning in the United States annually. With respect to salmonellosis alone, Slocum mentioned a seven-fold increase in reported cases nationally between 1950 and 1957. A similar gain, he said, was reported in Massachusetts, which has a long record of reporting such incidents.

Speaking of practical experience in a city laboratory with microbiological standards, Buchbinder stated that a frankly arbitrary tolerance had been effective in improving sanitation of specific foods notoriously associated with outbreaks.

The methods used include the plate count, coliform count, *S. aureus* count, enterococcus count, and *Salmonella* isolation. Isolated staphylococci are phage tested. A plate count above 750,000/gm. for staphylococci and enterococci in foods associated with an outbreak warrants a test for pathogens. Phage typing, said

Buchbinder, has implicated foods with low counts of staphylococci. Buchbinder expressed also the view that the standard plate count discounted the need for a coliform count. Jepsen and Slocum, in discussion, stated that coliform determinations provide information not revealed by the plate count alone.

In addition to testing foods implicated in outbreaks, the laboratory examines "check-up" foods associated with the implicated foods, which are not usually available. Other tests are performed on samples taken in general surveys of foods considered vulnerable.

The surveys are used mainly for preventive purposes, as in connection with frozen pre-cooked poultry products. Of 17 samples from one manufacturer, 13 were found to have counts of 1 million or more.

At about the same time, the department surveyed custard-filled items from 65 wholesale bakeries, establishing a standard plate count not to exceed 100,000/gm., and a coliform standard of no more than 10/gm. More than two-thirds of the bakeries flunked the test. Some of these improved their procedures and the count declined. The others made no improvement and were requested to discontinue the line. Several hundred retail bakeries have been examined annually on the same basis in recent years.

Standards for fresh crabmeat established by New York City (plate count not to exceed 100,000/gm., enterococcus, no more than 1,000/gm., staphylococcus and coliform, no more than 100/gm.) touched off a broad reform in packing practices on the eastern seaboard. The percentage of samples failing the test declined from 63 in 1953 to 37 in 1956, about the current level. Buchbinder also reported experiences with skinned, precooked, packaged, ready-to-eat beef tongue and with frozen, breaded, codfish cakes, demonstrating the value of microbial tests in supporting the efforts of sanitarians.

In conclusion, Buchbinder referred to the requirements applied to food purchased by the Armed Forces as evidence of the contribution of microbiological standards to the prevention of food poisoning.

Dr. John Silliker, Swift and Company, described in detail variations in food, flora, and processing which affect microbiological stand-

ards. He demonstrated several instances in which microbiological standards at a given stage of processing by themselves are meaningless with respect to safety or keeping quality of food. He emphasized consideration of the quality of raw materials, the treatments used, and the different microbial characteristics of individual components of a food product.

The need for administrative arrangements which would enable professional societies, trade associations, enforcement agencies, and others to work together effectively to develop mutually acceptable standards for the protection of the public was advanced by Dr. Keith H. Lewis, Public Health Service. Referring to the various efforts current, he commented that participation was associated with difficulties in obtaining timely action and continuity. He proposed that another meeting concern itself specifically with developing a workable plan, including mechanisms for coordination and financial support.

Lewis also suggested that specificity is an inherent characteristic of microbiological standards for foods, to judge by experience with water, shellfish, and dairy products. Methods and criteria, he said, must be appropriate to specific microflora, various potential contaminants, chemical and physical conditions, processing techniques, and distribution practices, if standards are to offer genuine protection. Although general standards for dissimilar foods may be expedient, he said, they are not adequate.

In summarizing the discussion, Goresline observed, "There was the feeling that within the framework of the food industry, the distribution and regulatory fields, something should be done to improve the sanitary quality and handling of food products. There was praise for the improvements that have taken place in the last few years, but with it an appeal to continue the rise. There were suggestions to broaden the areas of concern from the public health standpoint to include the viruses and chemicals. . . .

"Several speakers repeated the theme of the relationship of raw product quality and practice of good handling to the sanitation and quality of food offered the consumer. There has been a feeling that most food poisoning outbreaks could have been prevented if good prac-



tices had been employed. This indicated a great need for a more effective educational program aimed at every segment of the chain from producer to consumer. It was demonstrated that a motivated commercial producer of food products can through a rigid quality control program, and training of employees, consistently put out products of good sanitary quality. There is a need to spread this motivation.

"It was pointed out that regulations and laws spell out certain standards without indicating them as such. Experiences with standards have been good for the most part, but I heard no one advocate them for all products or for food in general. It was pointed out that there were different classes or types of food, each with its own needs, uses, and even different flora."

He pointed out that the conference favored standards with a definite use, but recognized that such functions might be performed by other methods. Difficulties in administering and interpreting standards were linked to the methodology and techniques employed. The conference inferred therefore, he suggested, that thorough investigation is a necessary preliminary to the establishment of standards.

He praised the conference for its coverage, the opportunity to exchange ideas, and to improve mutual understanding of the factors relating to food safety.

The conferees in general agreed that there were always implicit goals of microbiological quality which influence both the management and regulation of food processing.



### Retrolental Fibroplasia

The rate of decline in incidence of retrolental fibroplasia is indicated by figures obtained by the National Society for the Prevention of Blindness from seven States. Hyperoxia was associated with retrolental fibroplasia by K. Campbell, in the *Medical Journal of Australia* in 1951. Confirmation of this hypothesis was prominently published in 1953 and 1954; publications included newspaper feature stories and an article in the *Saturday Evening Post*.

States reporting the cases totaled here are California, Connecticut, Kansas, Massachusetts, New Jersey, New York, and North Carolina. Reporting

in 1957 was incomplete, and only 5 States reported in 1958. Following are the reported new cases of blindness caused by retrolental fibroplasia:

Year	New cases
1950	278
1951	363
1952	464
1953	442
1954	170
1955	62
1956	35
1957	10
1958	7

Despite the abrupt decline in incidence, it is evident that to provide maximum protection against blindness associated with retrolental fibroplasia, doctors, nurses, and hospital administrators need to adhere vigilantly to procedures recommended for administration of oxygen to premature infants.

An annotated bibliography on the relationship of oxygen therapy to retrolental fibroplasia is available from the National Society for the Prevention of Blindness, 1790 Broadway, New York 19, N.Y.

# The Institutionalized Population in Minnesota

STEPHEN J. CARROLL, Jr., M.A.

STATISTICS on the number of handicapped persons in hospitals and related institutions by type of disability are rare, except for those dealing with specialized types of institutions (1-4). A number of surveys on the extent of disabling illness and disease among the general population have been conducted, but typically such surveys exclude the institutionalized population. This lack of information makes any general disability survey incomplete, since the disabled in institutions are likely to form a significant portion of such a census.

Between July 22 and August 4, 1958, a survey of the entire institutionalized population of Minnesota was conducted under the direction of Dr. L. H. Lofquist and Dr. G. W. England of the University of Minnesota's Industrial Relations Center, for the State Interim Commission on the Employment of the Handicapped. This commission was appointed to investigate the problems of the handicapped population in Minnesota (5).

The purpose of this survey was to determine the number of handicapped persons by type of disability and age in all types of institutions and hospitals in the State. Every hospital, both general and specialized, institution, special school, nursing home, and boarding-care home was covered. The survey was completed in conjunction with a related survey covering a random sample of households in Minnesota. In the household survey, interviewers were required to identify all household members who were away in a hospital, institution, or

special school to prevent disabled persons from being counted twice. The results of the household survey are published elsewhere (6). This report deals only with the institutional survey.

## Methodology

A list of all licensed hospitals both general and specialized, institutions, special schools, nursing homes, and boarding-care homes in Minnesota as of May 1, 1958, was obtained from the Minnesota Department of Health (7). This list was supplemented by the addition of the names of all public specialized institutions and schools concerned with confinement and training under the control of the Minnesota State Department of Public Welfare and all Federal hospitals within the borders of Minnesota. A check of this list against all hospitals and related institutions listed in the Minneapolis and St. Paul telephone directories resulted in the addition of only one institution, a boarding-care home.

A questionnaire was designed to identify all persons who were handicapped and currently hospitalized or institutionalized in Minnesota by type of disability and age. In developing the questionnaire, consultations were held with the directors and medical personnel of several of the larger hospitals and institutions in Minneapolis. These consultations were held to determine the best method of classifying patients as handicapped and to see what terminology was most common and understandable to hospital personnel.

The questionnaire was worded in such a manner that it could be completed by the physician in charge of each ward, by the nurse in

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charge of each nursing station, or by the medical person in charge of each hospital or home. A patient was to be classified as handicapped if he or she was expected to be totally or partially impaired in carrying out normal activities for the next 90 days, whether still hospitalized or not. The term "impaired in carrying out normal activities" was used in place of the term "handicapped" since it was preferred by hospital and medical personnel consulted in preliminary studies. Ninety days was used as the time period for which an impairment would be considered serious enough to be classified as a handicap since 90 days, or 3 months, is the time period most frequently used to distinguish chronic diseases and severe disabilities from other less severe types (8, 9). Length of time hospitalized was not used as the criterion for classifying patients as handicapped because it excludes many chronically ill or disabled persons and also may not be indicative of the extent or severity of a disability or disease.

Fourteen broad disability categories, derived from the disability classification systems of the Minnesota Employment Service and the Minnesota Division of Vocational Rehabilitation, were used in the questionnaire. Three age groups were used to distinguish potential members of the labor force from those patients younger or older than this group.

Questionnaires were mailed to each of the 641 hospitals, special institutions and schools,

nursing and boarding-care homes on the survey list. Hospitals and institutions with a capacity of more than 150 beds were sent additional questionnaires upon request for use in each ward or at each nursing station, if this procedure was preferred. A followup postal card was sent to nonresponding institutions after 2 weeks, and a followup letter was sent to nonrespondents after 3 weeks to encourage increased returns.

As a verification of survey accuracy, returns from the large specialized institutions, such as mental hospitals and institutions for the mentally defective, were compared with data obtained from the Minnesota State Department of Public Welfare (1). The survey indicated that there were 14,338 impaired patients in such institutions, while the Minnesota State Department of Public Welfare reported 14,202 patients as of June 1958. A comparison of figures for each institution also agreed quite closely.

The proportion of usable returns gives another measure of the accuracy of the survey. In terms of this criterion (proportion of returns), the results obtained in the survey may be accepted with confidence since usable returns were received from 82 percent of the hospitals and related institutions in Minnesota. These hospitals and related institutions contain 91 percent of beds available in the State. Each table presents data adjusted to account for nonresponding institutions. In making estimates

**Table 1. Number of physically handicapped patients in Minnesota hospitals and related institutions, by type of institution**

Types of institutions	Bed capacity of institutions to which questionnaires were sent	Bed capacity of institutions from which questionnaires were received	Number of impaired patients reported	Percent of beds occupied by impaired patients <sup>1</sup>	Number of impaired patients corrected to include non-respondents <sup>2</sup>
Federal hospitals-----	2, 456	2, 443	1, 693	69. 3	1, 702
General hospitals-----	14, 558	14, 278	5, 273	37. 1	5, 302
Mental hospitals-----	10, 890	10, 863	10, 794	99. 4	10, 820
Institutions for the mentally deficient, epileptic, or tuberculous-----	6, 814	6, 814	6, 191	90. 9	6, 191
Other special schools, hospitals, and institution infirmaries-----	1, 008	948	706	74. 5	751
Nursing and boarding-care homes-----	13, 545	9, 718	7, 288	75. 0	10, 157
Total-----	49, 271	44, 994	31, 945	70. 9	35, 023

<sup>1</sup> Obtained by dividing column 3 by column 2.

<sup>2</sup> Obtained by projecting from percentage in column 4 to bed capacity in column 1.

**Table 2. Percent of institutionalized handicapped population of Minnesota, by type of disability within major age categories**

Disability	All ages (N=35,023)	Under 14 (N=1,860)	14 to 65 (N=16,408)	Over 65 (N=16,746)
Neuropsychiatric	35	6	44	29
Mental retardation	19	53	30	4
Cardiovascular	13	3	4	23
Generalized or systemic	7	2	3	12
Orthopedic	5	9	3	6
Neurological	4	4	4	5
Miscellaneous	4	2	3	6
Respiratory	3	4	4	3
Visual	2	6	1	3
Hearing	2	9	1	2
Gastrointestinal	2	0	1	2
Genitourinary	2	1	1	3
Skin and allergy	1	1	0	1
Speech	1	0	0	1
Total percent	100	100	100	100

NOTE: Numbers adjusted to include nonresponding institutions.

to account for nonrespondents, it was assumed that the returns from the nonrespondents in a particular type of hospital or institution would assume the same proportions regarding the number of handicapped persons in each disability and age category as did the returns from the respondents. This assumption was made in view of the high percentage of returns received and in the absence of any evidence that the characteristics of the nonrespondents were different from those of the respondents.

The percentage of available beds occupied by handicapped persons varies widely depending on the type of institution (table 1). While the whole population (99 percent) of the State's mental hospitals is handicapped, according to the definition used in the study, only a little more than one-third (27 percent) of the population of general hospitals is handicapped. This is certainly not surprising in view of the types of disability treated.

Almost all of the Federal hospital beds are located in two large veterans' hospitals in Minnesota. Since one of these is a specialized institution for the treatment of emotional disorders, it is also not surprising to find 69 percent of the available Federal hospital beds occupied by handicapped patients.

Neuropsychiatric disabilities (35 percent)

and mental retardation (19 percent) account for more than one-half of the total institutionalized handicapped population of the State (table 2). This bears out previous estimates that more than one-half of the available hospital beds in the Nation are occupied by patients with mental disorders (10). The addition of persons afflicted with cardiovascular (13 percent) or generalized or systemic (7 percent) disorders to those reported with the mental and emotional disabilities reveals that these four types of disability account for three-fourths of the institutionalized handicapped.

The most significant disability of the institutionalized handicapped population under 14 years of age is mental retardation. More than one-half (53 percent) of this age group have this disorder (table 3). Persons with emotional (44 percent) and mental disabilities (30 percent) make up almost three-fourths of the institutionalized handicapped in the productive labor force age group of 14 to 65 years. In the retirement age group of over 65 years of age, neuropsychiatric (29 percent) and cardiovascular (23 percent) handicaps are most prevalent, accounting for more than one-half of the in-

**Table 3. Institutionalized handicapped population in Minnesota, by age distribution within disability categories**

Disability	Number <sup>1</sup>	Percent in each age group			
		All ages	Under 14	14-65	Over 65
Neuropsychiatric	12, 259	100	1	59	40
Mental retardation	6, 592	100	15	75	10
Cardiovascular	4, 532	100	1	13	85
Generalized or systemic	2, 556	100	1	21	78
Orthopedic	1, 759	100	9	30	61
Neurological	1, 514	100	5	42	54
Miscellaneous	1, 529	100	2	33	65
Respiratory	1, 145	100	7	56	37
Visual	816	100	14	20	66
Hearing	741	100	24	20	56
Gastrointestinal	614	100	1	37	62
Genitourinary	613	100	3	18	79
Skin and allergy	186	100	7	36	57
Speech	158	100	3	18	79
Total	35, 023	100	5	47	48

<sup>1</sup> Adjusted to include nonresponding institutions.

stitutionalized handicapped in this age category.

Table 3 shows that 85 percent of the institutionalized handicapped with cardiovascular disabilities are over 65 years of age, as are 78 percent of those patients who have generalized or systemic disorders. Generalized or systemic disorders include such disabilities as diabetes, cancer, and arthritis. Three-fourths (75 percent) of the mentally retarded patients are between 14 and 65 years of age.

### Summary

A survey of the institutionalized handicapped population of Minnesota was conducted between July 22 and August 4, 1958. The purpose of this survey was to determine the number of physically handicapped persons in all types of hospitals and related institutions in Minnesota by type of disability and age. This information was not available before the survey.

A questionnaire, designed to obtain this information, was sent to every hospital, both general and specialized, institution, special school, nursing, and boarding-care home in Minnesota. With the aid of two followup letters, usable returns were received from 82 percent of the hospitals and related institutions in the State. These hospitals and related institutions contained 91 percent of the beds available in hospitals and institutions in the State.

The survey indicated that currently about 35,000 handicapped persons are hospitalized or institutionalized in Minnesota. These persons occupy more than 70 percent of the beds available for the care of patients in the State. Almost one-half of them are over 65 years of age. Persons with neuropsychiatric disabilities (35 percent) and mental retardation (19 percent) comprise over one-half of the institutionalized handicapped in the State. Cardiovascular (13 percent) and generalized or systemic (7 percent) disabilities bring this figure up to almost three-fourths of the total institutionalized

handicapped. Mental retardation seems to be the most significant disability for the group under 14 years of age, while neuropsychiatric disabilities are most prevalent in those 14 to 65 years of age. Neuropsychiatric and cardiovascular disorders account for more than one-half of the handicapped in the over 65 age group.

The success of this survey demonstrates that it is possible to obtain reasonably accurate disability statistics of the general institutionalized population by using a mail questionnaire method.

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# The Issues

## IN CHRONIC DISEASE CONTROL

The State and Territorial Chronic Disease Program Directors organized as an association at their third biennial meeting held in Chicago, September 21-23, 1959, and affiliated with the Association of State and Territorial Health Officers.

"Health Department Leadership in Chronic Disease" was the theme of the meeting. Resolutions on chronic disease adopted by the association are briefed in this report, and two of the papers presented to the conference are summarized.

Officers elected for the current year are Dr. Lester Breslow, chief, division of chronic diseases, California State Department of Public Health, president; Dr. Harold S. Barrett, deputy commissioner and director of chronic disease control services, Connecticut State Department of Health, vice president; and Dr. Forest R. Brown, director, division of chronic disease control, Oklahoma State Department of Health, secretary-treasurer.

On the executive committee are Dr. Marian R. Stanford, director, chronic illness control, State Department of Health, Trenton, N.J.; Dr. Milton Feig, acting director, division of chronic diseases and aging, Wisconsin State Board of Health; Dr. J. L. Jones, head, chronic disease section, Washington State Department of Health; and ex officio, Dr. Frank W. Reynolds, formerly director, bureau of chronic diseases and geriatrics, New York State Department of Health, now associate professor of public health practice, University of Michigan School of Public Health.

Resolutions adopted by the newly formed Association of State and Territorial Chronic Disease Program Directors at their meeting last fall reveal an assessment of the current issues in chronic disease programs throughout the Nation. In each instance, the resolutions recommended actions to the parent organization, the Association of State and Territorial Health Officers.

*Full-Time Leadership in Chronic Disease.* Health officers should be urged to give full-time medical and public health leadership to chronic disease activities and establish appropriate organizational units in their health departments.

*Diabetes.* The Public Health Service should be requested to convene an expert committee to establish standards for screening and diagnostic followup in the early detection of diabetes. It was stated that full use of modern knowledge is not current practice in diabetes casefinding.

*Nursing Homes.* Delegation of responsibility for licensing and continuing supervision of nursing homes as a function of State departments of health was recommended.

*Homemaker Service.* State health officers should be requested to act with State welfare and other appropriate agencies to promote community homemaker services as a component of a full home care program.

*White House Conference on Aging.* There should be vigorous leadership by health officers to insure adequate emphasis on the health aspects of aging in the 1961 White House Conference and in all preceding local conferences.

*Disability.* Health officers should be urged

to assume leadership in developing programs in disability, including aid to disabled persons whose goals are less than employment, and in seeking Federal funds to implement programs with this objective.

*Epidemiological Method.* Health officers should be urged to promote further use of the epidemiological approach to chronic disease control.

*Social Work, Social Science, and Behavioral Science.* Encouragement should be given to the use by health departments of workers in the social sciences.

As a final formal action, the association approved the concept of Federal grants to local health agencies for chronic disease control activities. It recommended vigorous support of the new community cancer demonstration project grant program of the Public Health Service. It was suggested that health officers take the lead in seeking substantial additional Federal grants for other categories of chronic disease control and in developing plans for such a project grant program.

## Caring for the Chronically Ill In Existing Facilities

It has been estimated that the minimum number of facilities needed for the care of the chronically ill and disabled is two beds per 1,000 population. If most States are like Michigan, it will, in all probability, be a long, long time before 15,000 beds for the chronically ill are available within their boundaries. Brick and mortar programs for care of this portion of our sick population are very important; nevertheless, we cannot afford to wait to take steps to improve and extend facilities for the care of this group until the ideal quota of beds and housing is reached. State and local governments should plan carefully and initiate programs so that each year brings progress in terms of better facilities. In the meantime, governmental agencies also should consider

what physical facilities are available or can be adapted for care of the long-term patient.

Most chronically ill patients are admitted to a general hospital during the acute phase of their illness and they are not distinguished from other patients who are acutely ill. Rehabilitation services which should begin during this acute stage of illness or disability are not made available. Later no provision is made for transfer of the chronically ill to other facilities which supply the continued care and treatment they need.

As the local general hospital is considered more and more as a community health center, the ideal solution to the problem of giving hospital care to long-term patients would be to extend and coordinate the facilities and services of the general hospital, through the construction of a chronic disease annex or a county medical care facility adjacent to and obtaining most of its services from the general hospital.

An independent chronic disease hospital should be considered necessary only when there is no practical way to provide long-term care in a general hospital, either physically or administratively.

Rather than wait until these highly desirable facilities can be provided, however, immediate needs in the treatment of the chronically ill should be met by using fully all services and physical plant areas now available in existing facilities. Consideration should be given to:

- Conversion of a former unit of a general hospital, such as a discontinued nurses' residence or excess bed capacity, to a chronic disease unit or skilled nursing home.
- Greater use of county medical care facilities, through the extension of additional services offered to patients.
- Conversion of tuberculosis sanatoriums with excess beds to a chronic disease hospital or skilled nursing home.
- Development of a closer relationship between hospitals and nursing homes, and upgrading the level of care in nursing homes by supplying nursing and medical supervision or consultation in the same manner as some hospital personnel are overseeing the operation of small community health centers.

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*Based on a paper by John A. Cowan, M.D., director, division of tuberculosis and adult health, Michigan Department of Health, Lansing.*

- Greater use of diagnostic facilities in hospitals by supplying outpatient services for the chronically ill, ambulatory patient.

- Development of home care programs through the coordinated efforts and facilities of all local agencies, voluntary, private, and tax-supported.

### **Transition in Michigan's Sanatoriums**

In Michigan in June 1959 there were 19 State-approved tuberculosis sanatoriums with a total capacity of 4,188 beds. As in most other States, the bed needs for tuberculosis are declining. Changes and improvements in the treatment of tuberculosis have brought us toward much shorter periods of hospitalization than was true a few years ago. This, as well as the lower incidence of tuberculosis, has lessened the need for beds for the hospital care of the tuberculous.

As a result, many tuberculosis hospitals have only a small fraction of their beds filled, per diem costs have skyrocketed, and it has become a prerequisite to economic survival to plan for other uses of their excess beds, or of the entire institution.

In 1957, Michigan passed the following legislation concerning county tuberculosis hospitals: "The board of trustees, with the approval of the board of supervisors, may in its discretion admit patients to said hospital for the treatment of diseases other than tuberculosis under such terms and conditions as prescribed by said board of trustees and approved by the State health commissioner. Persons . . . suspected or afflicted with tuberculosis and requiring hospitalization in the hospital or sanatorium shall be given priority of admission."

Since 1950, 11 tuberculosis hospitals approved by the State have closed. Of the 15 county sanatoriums now in operation, 7 have converted their facility to admit chronic disease patients under the 1957 legislation. Although tuberculosis sanatoriums in general are far from ideal chronic disease hospital facilities, they can be adapted to become fairly satisfactory institutions with certain modifications in physical organization and in the type of staff. Evaluation of the use of these facili-

ties for the care and treatment of the chronically ill should be made on an individual basis.

### **Advantages**

The medical, nursing, and other staff of tuberculosis hospitals understand the problems of the long-term patient. The tuberculosis patient today, in most instances, is aged, with other chronic illnesses that must be treated simultaneously. Those who realize the difficulties encountered by the staff in most general hospitals dealing with long-term patients already know that familiarity with care of the long-term patient is a distinct advantage.

Existing services, such as occupational therapy, dietary, X-ray, laboratory, medical, and nursing services, can extend to the nontuberculosis unit. On the other hand, social service, physiotherapy, and other special services required for care of the nontuberculous will also improve the care of tuberculous patients.

With the disease declining in emphasis, it is difficult to recruit good medical, nursing, and ancillary personnel for a tuberculosis hospital. Chronic disease care is a rapidly expanding field and is more attractive to hospital personnel.

Proration of the expense of administration, housekeeping, maintenance, utilities, and the like results in a reduction of the per diem costs of the tuberculosis unit as well as the chronic disease unit, because of better use of facilities.

### **Disadvantages**

Unfortunately, some local practicing physicians in general hospitals tend to refer to the chronic disease hospital patients whom they do not wish to treat, patients that no one else wants. Many of these patients are very ill and some of them moribund at the time of admission to the hospital.

There is always the possibility that, under these circumstances, medical and nursing staffs will become so concerned with emergency problems that the tuberculosis patient will be neglected. As an illustration, the death rate of nontuberculous patients in two specific sanatoriums has averaged from 20 to 40 percent in



comparison with the rate of 2 to 2½ percent in general hospitals. The medical and nursing duties for these dying patients are not only mandatory, but time consuming. Also, when treating these two types of patients at the same facility, tuberculous and nontuberculous, the problem of cross-infection must be considered at all times. Although this problem is serious, it is by no means insurmountable, however, and practical solutions have been found.

Local welfare departments may transfer postoperative and other acutely ill patients from the high-cost general hospital to the low-cost chronic disease hospital prematurely. These patients, when admitted to the chronic disease unit, require a disproportionately large degree of medical and nursing staff time, which greatly increases the cost of the care.

### Factors in Transition Planning

There is need for a plan for progressive treatment of the chronically ill or disabled patient from the acute stage to the maximum point of rehabilitation potential, which may mean self-sufficiency, self-care, or partial care in a foster home, or other care, using whatever services or facilities may be available.

Admission and discharge policies should include a decision that only those patients should be admitted who will benefit from active medical care; specific planning of the level of patient care; and a clearly defined discharge policy if the chronic disease hospital is not to become purely a domiciliary facility. Personnel must be available in the area to meet the need for medical, nursing, and ancillary services. Medical specialty services on a consultation basis should also be available, plus the physiotherapist and occupational therapist, social worker, and adequate nursing personnel. The full-time medical staff must be adequate, qualitatively and quantitatively, since experience has shown that the private attending physician seldom visits the patient; thus medical supervision becomes the full-time responsibility of the staff.

Planning the layout of the physical plant must permit proper separation of tuberculosis and nontuberculosis areas, and the complete cutoff necessary to alleviate the possibility of cross-infection.

A final factor in planning is the potential home care services for the patient after he is ready for discharge to his home or foster home.

### An Example in Saginaw

The Saginaw County Hospital was planned initially solely for the care of tuberculosis patients. At a later date its services were expanded to include the care of patients with chronic diseases. Between 1950 and 1954, the capacity of the hospital was expanded to 250 beds to meet the critical shortage of beds for the care of tuberculosis patients. Shortly after the latter addition was completed, the need for beds for tuberculosis patients declined.

While the situation in this particular area was not as critical as in some others, it became evident that consideration would need to be given to eventual conversion of some of the facility to the care of other types of patients. In 1957, after passage of permissive legislation by the State which allowed use of existing beds in tuberculosis hospitals for the care of nontuberculosis patients, application was made to the State health commissioner for approval of a plan for this purpose.

There are three general hospitals and a county infirmary within the city of Saginaw, in addition to the Saginaw County Hospital. There was a definite need in the community for a chronic disease unit. It was believed by many local physicians that this unit should either be attached or adjacent to one of the general hospitals. However, public approval of bond issues for this purpose was refused a number of times. Finally, the county board of supervisors granted approval to construct a chronic disease unit for the care of county welfare patients, as an addition to the Saginaw County Hospital Annex, the former convalescent unit for tuberculosis patients. The new addition, at a cost of \$115,000 plus \$35,000 to make alterations to the old annex, made the total conversion cost \$150,000.

The capacity of the unit is 50 beds. The first floor has a day room, lobby, administrative office, diet kitchen, and eight rooms for patients, three of which are security rooms for the temporary retention of the emotionally disturbed. The ground floor includes the department of physical medicine and a multipurpose room

which serves as a recreation room and chapel. The balance of the ground floor is used completely for the rehabilitation of patients. There are facilities for both physical and occupational therapy, together with facilities used in teaching patients to be self-sufficient upon return to their homes. This section also has access to a park area for patients.

Consultant psychiatrists from the University of Michigan meet with the hospital medical and paramedical staff every 2 weeks to review progress of patients and to evaluate rehabilitation potential of new patients.

Although at first there were a few misunderstandings with the local medical profession about the use of the facility, this problem was solved through close liaison with the geriatrics committee of the county medical society. The chronic disease unit is administered as a part of the hospital, but admissions are authorized by the welfare board; the board of supervisors set a policy of admitting only indigent patients. Private physicians are permitted to treat their own indigent patients, receiving fees for their services from the welfare department. However, this procedure is infrequent, most of the patients being treated by the full-time hospital staff. Medical specialty consultants in Saginaw are available when needed.

There is a great deal of public sentiment in favor of admission of private pay patients but as yet the policy has not been changed.

All facilities of the hospital are available to the chronic disease unit.

Chronic disease services are more expensive than tuberculosis services. It requires one employee per patient to provide nursing, rehabilitation, and housekeeping services. Under certain circumstances, the ratio of employees to patients may go even higher. If laboratory, X-ray, kitchen, and maintenance services are included, the total ratio is 1.5 employees per patient. The total cost including all services in this facility is \$15 per day.

A great many patients have been admitted who have little or no rehabilitation potential. The admission policies are weak since admission and selection of patients is decided by the welfare board and not by the hospital director. Due to the high cost of care in general hospitals, postoperative patients requiring active medical

service are often sent to the chronic disease unit without proper consideration of the main objective of the unit, rehabilitation.

With the support of the county medical society, arrangements have been made for outpatient service to ex-patients so that their progress can be evaluated by the medical and paramedical personnel. With the support of a Michigan Department of Health grant, the rehabilitation center is used also as a focal point for instruction and training of patients and is an integral part of an organized home care program to which many of the patients are discharged.

### **Comparative Costs**

The average per diem cost of 23 representative general hospitals in Michigan as of December 1958 was \$34.08, as computed by the Michigan Hospital Association. One of the northern counties in our State has an agreement with a large local general hospital to pay a flat rate of \$25.86 for the county's indigent patients. This county has recently constructed a new medical care facility as an annex to the general hospital. The estimated average cost in this institution will be \$8.90 when the institution reaches its capacity of 90 patients. It should be emphasized that this cost includes only ordinary medical, laboratory, X-ray, physiotherapy, and similar services. It can be seen readily that the cost of caring for such patients will be considerably reduced as soon as they can be transferred from the general hospital to the medical care facility.

The State social welfare department reports that average per diem costs in a medical care facility range from \$5 to \$12.50, depending primarily on the geographic area of the State where the facility is located and the type of care offered. The average cost in 1958 for all medical care facilities in Michigan was \$7.28, excluding depreciation. Most of these facilities would compare with a skilled nursing home with respect to services. A few facilities have physical and occupational therapy in addition to ordinary services.

As of this date, the average per diem costs of chronic disease units operated in cooperation with tuberculosis sanatoriums are:

<i>Chronic disease unit</i>	<i>Per diem cost</i>
Sunshine Hospital, Grand Rapids-----	\$17.73
Saginaw County Hospital, Saginaw-----	15.00
American Legion Hospital, Battle Creek--	14.74

These costs approximate 50 percent of local general hospital costs.

A recent survey in the State revealed the following costs in nursing homes of the skilled category:

<i>Nursing homes</i>	<i>Per diem cost</i>
40-bed home (all private patients)-----	\$8.11
41-bed home (3/4 private, 1/4 public aid)--	5.71
80-bed home (3/4 private, 1/4 public aid)--	7.25
75-bed home (3/4 private, 1/4 public aid)--	5.55

## Conclusion

It is generally agreed that patients with long-term illness and disability usually can be given the best care in chronic disease hospitals or annexes attached or immediately adjacent to general hospitals. However, this ideal situation appears unattainable in most areas within the foreseeable future.

Most States have facilities, such as portions of general hospitals, nursing homes, or tuberculosis hospitals, that can be converted and used eventually as institutions for the care of the chronically ill under most circumstances, if the institutions are located in an area where medical specialty services and trained staff are available.

Although the average tuberculosis hospital is by no means ideal as a chronic disease unit, it can be an acceptable substitute until such time as specially built chronic disease hospitals can be financed and constructed.

## The Geriatric Program In Santa Cruz, Calif.

As a means of improving the health status and good health potential of recipients of old age security payments in Santa Cruz, Calif., a physical screening program has been in operation since September 1955. It is a voluntary

program which retains the traditional association of private physician and patient, permitting personal preference to be the determining factor in the patient's selection of physician and hospital, when required. The objective is to encourage early diagnosis and treatment, thus reducing long-term institutional care.

Santa Cruz County is situated on the coast adjacent to the San Francisco Bay area. It comprises about 400 square miles between the coastal range of mountains and the Pacific Ocean. The population is approximately 75,000; of these, 1 in every 7 is over 65 years of age, about 10,000 persons. From 1955 through 1959, a little over one-third of these 10,000, or an average monthly caseload of 2,416, were recipients of old age security. In 1955, women outnumbered men two to one and the median age for men was 76, for women 75. The median age to receive OAS was 68.

Of 58 counties in California, 38 maintain a full-time health department and Santa Cruz is one of these. The primary public health center is located in the city of Santa Cruz, the county seat, and a secondary office supplying all services is maintained in Watsonville at the southern end of the county, 18 miles away. There is no regular transportation in the county, which poses a problem in the administration of any public health program but especially one dealing with the aged.

Early in 1955, the Santa Cruz Health Department sought the cooperation of the county welfare department in an effort to ascertain what could be accomplished to improve the health status of OAS recipients. At the same time, we sought, if possible, means to reduce costs by introducing a program designed to accomplish early diagnosis and immediate treatment, thereby maintaining the recipient in sufficiently good health so that long-term institutional care might be greatly reduced.

Following this initial inquiry into the problem, the California State Department of Public Health, specifically Dr. Lester Breslow, chief of the bureau of chronic diseases, was requested to make a study of the health status of OAS recipients in Santa Cruz County. This study indicated that a two-pronged attack, with a physical screening program on a voluntary

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*Based on a paper by Russell S. Ferguson, M.D., health officer, Santa Cruz County, Calif.*

basis, and second, with an effort to mobilize every available financial and community resource to insure immediate and complete treatment, might accomplish the desired results.

From September 1955 until September 1956, the screening program was confined to new recipients who had been processed by the welfare department in the Santa Cruz area. In October 1956, the program was expanded to include recipients previously on the rolls, and a second clinic was opened in Watsonville for OAS recipients in that area. Through August 1959, 1,501 physical examinations had been given, nearly one-half the average enrollment of 3,416 OAS recipients in the county.

Each examination consists of a careful history and a physical examination which includes a chest X-ray, electrocardiographic examination, and routine and special laboratory studies, augmented by a complete dental examination and measurement of eye tension for glaucoma. Each examination takes one-half hour.

The geriatric clinic is staffed by a physician who conducts the history-taking and physical examination, a public health dentist, public health nurse, and a social worker. Laboratory, X-ray, and electrocardiographic technicians are available for the three clinics held each week. In addition, a radiologist and internist from the county medical society read the X-ray films and electrocardiograms.

Dr. Elbert T. Rufson, although retired, serves voluntarily and without reimbursement as our physician. The county health department supplies the public health dentist, public health nurse, social worker, and technicians. The radiologist and internist may be said to contribute their services, since they receive only a very small honorarium.

A report of the results of the examination is sent by mail directly to the physician named by the recipient and includes a copy of the electrocardiograph, laboratory, and X-ray reports. Subsequently, the public health nursing service follows through to assure that the recipients are receiving medical care.

The so-called ineligible spouse, ineligible only because of being under the age of 65, constitutes a medical liability if neglected. The inclusion of these "ineligible" spouses in the program is provided under the regulations of

the California State Department of Public Welfare. If they live to the age of eligibility, they become OAS recipients in any case, and it is considered more economical to safeguard their health at this juncture, by screening them for physical defects along with their eligible spouses.

### Acceptance

Acceptance of the program among new recipients in the Santa Cruz area during the first year of operation was 72 percent. In 1958, the rate of acceptance for new recipients throughout the county had declined to 57.3 percent.

A major factor in this decline was the passage of the State medical care program in October 1957. California established its medical care program after passage in 1956 of amendments to the public assistance titles of the Social Security Act. These amendments provided that the Federal Government would match, on a 50-50 basis, State expenditures on vendor payments in behalf of public assistance recipients needing medical care up to a maximum determined by multiplying \$6 per month times the number of adults and \$3 per month times the number of children.

Other factors limiting the acceptance rate are the lack of transportation mentioned previously, the more or less rapid turnover of workers in the welfare department, and our own limitations in time and personnel. I am not at all sure, however, that we should seek a much higher rate of acceptance; our ability to give each recipient ample time for thorough study might be curtailed as a result.

### Financial Resources and Cost Comparisons

The cost of each examination as determined by the field auditor in the State controller's office was \$25.28 for the fiscal year 1957-58. In fiscal year 1958-59, it was a few cents higher, due to increases in the cost of services. It must be noted that if a physician had to be employed by the clinic, the cost would be at least \$5 more per examination.

The State department of social welfare advised us officially early in the program that

the cost of the screening examinations would be a proper charge against the welfare department's administrative fund. This fund is one-half Federal and one-half county money. Thus one-half of the cost of the screening program is obtained from Federal funds.

The county board of supervisors approved \$12,000 in the budget of the health department to assist in the treatment phase of the program, since it was realized that, in addition to the basic grant and excess income of the recipients, funds were required to supply medical services for conditions disclosed by the physical examination, when the recipient was unable to pay.

In the first year of operation, health department funds were used to supply care by a physician, through home and office visits, and drugs. With the passage of the State medical care program in 1957, the department switched its emphasis to surgical and dental services excluded from the State program. In addition, hearing aids, eye glasses, and other prosthetic devices were supplied. These services are given to any OAS recipient or ineligible spouse, whether he attends the geriatric clinic or not. The cost of these services in fiscal year 1958-59 equaled approximately the \$12,000 budgeted for treatment services by the health department.

The per capita cost of providing surgery, dental care, and ancillary services for the entire average roll of 3,416 recipients was 16 cents per recipient per month in 1958 and 21 cents per recipient per month in the first 6 months of 1959. Under the program, 21 surgeons have performed 37 major operations and 6 minor procedures. As might be anticipated, cataracts and genitourinary conditions lead the list of operations.

Not less than \$25,000 per month is expended on long-term institutional care for OAS recipi-

ents in Santa Cruz County. In contrast to these figures, of 664 recipients examined in the geriatric clinic prior to December 1957 for whom complete records are available, only 17 have ever been in a boarding or nursing home in the past 40 months. The total time in such homes was 174½ months; the total cost was \$19,966. This is over \$5,000 less than the cost of the entire OAS enrollment for 1 month alone.

Eleven ineligible spouses were examined at our clinic prior to 1957, and a total of \$1,650.41 was spent for home and office visits by physicians, and for drugs, surgery, dentures, and appliances. Of these, five spouses have since become eligible recipients under the OAS program and have entered the roll in good health.

### Conclusions

We conclude that some important results have been achieved in Santa Cruz County as the result of our approach to the problem of the aged. First, an increased interest by the individual in maintaining his own health was achieved by the examination and immediate referral to the physician of his choice. Second, we have been able to mobilize financial and community resources, thus making it possible for the vendors of medical, dental, and ancillary services to assist the OAS recipients in maintaining good health status. Third, we have been able to restore these people to the dignity of private patients in private hospitals for surgical care, resulting in impressive savings to the county. And finally, we are convinced that these services can be given at exceedingly low cost, contributing to the prevention of long-term illness requiring institutional care and to the prevention of blindness.

# Airport Sanitation

LOUIS F. WESTBROOK and ELIZABETH REED

AT the new International Airport in Miami, Fla., the Dade County Health Department has assigned to full-time duty a sanitarian, Martin Donovan, with as much responsibility for the health, comfort, and safety of the passengers as any pilot, monitor, stewardess, or ground crew. The airport is believed to be the only one in the United States with a sanitarian on duty full time.

Sanitation services were considered early in the planning of the airport by the Dade County Port Authority, established in 1945.

Even before the opening of the airport, in December 1958, Donovan spent half of his time on the installation and operation of the aircraft catering kitchens and the facilities for storing, preparing, and serving food for employees and other patrons.

## Description of the Terminal

The field, on 3,000 acres in the northwest corner of Miami, handles 10 percent of all the air traffic in the Nation. During peak seasons, it employs between 25,000 and 30,000 people. In 1959 its 74 gates in 6 loading and unloading piers admitted 4,248,064 passengers, 19,020,336 pounds of airmail, and 206,273,548 pounds of express and freight. Lines using the airport included 7 domestic and 26 international carriers, 34 irregular carriers, 2 scheduled air

taxis, and 1 irregular air taxi. At peak periods, the control tower handles as many as three plane movements in 1 minute.

The new terminal building and new airport facilities so far have cost more than \$26,435,000. The complete planned program is expected to cost more than \$8,000,000 more. A road network within the airport has cost over \$3,500,000. Directional signs alone have cost \$57,500.

The seven-story terminal, entirely air-conditioned, is topped by a control tower. It provides passenger service areas and administrative offices on the first two floors. The next five floors house port authority, airline, and governmental administrative offices as well as radar control equipment areas. The Airport Hotel, five floors of hotel space with 250 rooms, is a separate building which fronts the terminal and has the second level overhang of the terminal as its foundation.

Three completely independent generators, all underground, supply electricity. The load automatically shifts from one to the other in event of power failure. In the unlikely possibility that all three should fail simultaneously, small generators, capable of operating indefinitely, will take over emergency functions.

On the ground floor of the terminal building, central control boards constantly record and analyze the electrical system and warn of impending functional difficulties.

An indirect expansion system of air conditioning regulates temperature automatically throughout the building. Chilled water, circulated through miles of concealed pipes, blows to more than 100 individual units distributing cool air.

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the rate of 25,000 gallons per hour to aircraft waiting on the ramp.

### Sanitation in the Jet Age

Two sets of triturators are manned from 8:00 a.m. to 5:00 p.m., the peak periods for discharge of waste collected by soil carts from aircraft. Triturator rooms are used exclusively for emptying, cleaning, and chemical treatment of soil trucks and portable soil buckets. Triturator rooms receive hot and cold water from Clayton flotation tanks under pump pressure. A physical air break between the city water service line and the feeder for the flotation tanks eliminates any possibility of contamination of the city water supply through back siphonage.

All garbage and waste are stored in metal flytight, leakproof, rollaway containers, in sizes varying according to need. Garbage and waste at present are picked up and hauled away once or twice a day by three private contractors, under supervision of the waste division of Dade County. Additional control is also vested in the county health department and the port authority.

Potable water is fed to planes from spigots on the ramps, either through water carts or through direct hose connections to the aircraft watering system. The spigots are restricted to this use only and are so labeled.

### Early Planning

As plans for the terminal were in their closing phase, the county health department requested that blueprints be submitted to it for examination by the various agencies concerned. A series of meetings were then held jointly by the Public Health Service, Florida State Board of Health, Dade County Health Department, Florida State Hotel and Restaurant Commission, Dade County Building, Zoning and Plumbing Department, and the architects.

As a result of the study by these groups, several changes and modifications were effected in the types of sanitary construction. The plans, revised according to these recommendations were then resubmitted in triplicate to the Public Health Service, the State board of health, and the county health department.

After construction was underway, the county health department director assigned Donovan to the terminal on a part-time basis. He daily examined plumbing installations, equipment installation in the triturator rooms, employee and public restroom facilities, food and beverage installations, airline servicing areas and intended watering points, ventilation and air-conditioning systems, as well as other phases of construction that related to public health and safety.

Any deviation from the plans or the codes covering the construction as it related to health and safety aspects was called to the attention of either the architect or the contractor or both.

Shortly before the formal opening of the new building in December 1958, the county health department assigned the sanitarian to full-time duty at the airport. This duty extends beyond responsibility for assuring that waste disposal, potable water supply, catered airline meals, meals for airport employees, and removal of wastes from aircraft chemical toilets and other facilities are operated without hazards to health and safety. It is concerned also with health cards for food handlers; rodent and insect control; animal quarantine; inspection of aircraft galleys, public drinking fountains, restaurant dishwashing and glass-cleansing equipment, and frozen food storage; vigilance against contamination of water supply; and intermittent emergencies.

### Sanitarian on the Job

The airport sanitarian applies two codes. The first, the Florida State Sanitary Code, governs retail establishments in the terminal and the Consumer Service Building as well as the Airport Hotel, and restaurants, lunchrooms, cafeterias, juice stands, and liquor bars. The State code also permits control of insect and rodent problems, public and employee restroom facilities in the terminal and on the airport, sewage and waste disposal, and public water supplies.

The second is the "Handbook of Sanitation for Airlines" (PHS Publication No. 308) which notes provisions of Public Health Law #10 for the prevention and the spread of communicable diseases in interstate commerce.

Under this law, the sanitarian inspects and certifies catering companies that supply aircraft. He sees that the removal and handling of sewage and other refuse from aircraft is satisfactory. He protects the servicing areas for aircraft, especially watering points, and he inspects the maintenance and condition of aircraft water systems, galleys, and restrooms.

For example, a refurbishing company received an order to install galleys in some new prop-jet aircraft. The manufacturer installed the equipment in the first plane without submitting the plans to the Public Health Service regional office, as the contract specifically directed. When installation was completed, the airport sanitarian was requested to inspect it. He reported that the construction failed to meet requirements for easy cleaning and left many areas open to insect harborage and breeding. The manufacturer was ordered by the Service to rework the installations and bring them up to the required specifications.

The county health department and the airport sanitarian work closely with the regional office of the Public Health Service at Atlanta, particularly with respect to plans for new equipment to be used for food or beverage service aboard aircraft or in flight catering kitchens, and new equipment used in servicing aircraft drinking water systems or toilet systems. The airport sanitarian provides on-the-spot reports for the Public Health Service. He also obtains plans or designs for this type of equipment from the manufacturer or the operator and forwards them to the regional office for comment, recommendations, or approval.

The sanitarian reports through local and State channels to the regional office of the Public Health Service on certification inspections. These reports cover two specific activities: airline catering points sanitation, and airline servicing area sanitation. Inspections include the premises and procedures in places furnishing inflight meals and other food services to airline passengers and personnel: the removal of sewage and other wastes from the planes; and the general sanitation of the servicing area, including the potable water transfer and storage.

When Donovan finds that sanitary regula-

tions are being violated, the Public Health Service is notified. If the violator is a supplier for the airlines, the regional office then notifies all carriers concerned by telephone or telegraph. After the violation has been corrected, the airlines are notified again. Periodic inspections determine whether certified suppliers remain on the Interstate Carrier Classification List.

Typical of Donovan's relations with other regulatory agencies was his survey, conducted with the Dade County Building and Zoning Department, to find and correct plumbing faults. The survey located 115 cross connections, for the most part submerged inlets in the aircraft plating shops. These hazards in acid and dye vats posed a threat of back siphonage to the municipal water supply. The cross connections were corrected by physical air breaks where possible or by installation of approved vacuum breakers and introduction of air under pressure where needed for agitation in the tanks.

### **Management Relations**

The following is a practical example of working relationships between the airlines and the county health department. Donovan objected to the drinking water facility in the aft galley of one model of aircraft. The plastic tubing used in transferring drinking water from the galley portable water container through the water spigot was fixed so as to obstruct cleaning and sanitation. At the same time, handling of the tube as it was threaded to the water container invited contamination.

It was suggested that the airline explore the possibility of using single service tubing, as on bulk milk dispensers. After discussion with the airline chief of food and catering service and the project engineer, the engineering department designed a spring tension clip-type handle to be used in connection with single service tubing and a model has been ordered for testing. If the tension spring clip operates satisfactorily in flight, the airline will convert all water containers in question to single service tubing.

Complaints by the public or employees concerning sanitary matters are reviewed by the director of the port authority, his staff, and the

sanitarian. The airlines personnel confer with Donovan on matters pertaining to aircraft galley construction, potable water trucks, soil carts and trucks, food and drink equipment used in aircraft galleys, hygiene for personnel, and food employees' food handler training programs, as related to such service aboard aircraft.

Full-time duty at the airport goes a long way to curb or prevent deliberate violations of sanitary practice by persons intent on shortcuts, whether motivated by the demands of peak traffic conditions or by a misguided sense of economy. Donovan's surveillance, characterized by daily visits, is supplemented by occasional visits on nights, Sundays, and holidays.

The informal reporting of insanitary conditions by employees is a valuable adjunct to airport sanitation, whether it concerns defective locks on toilet stalls or industrial hazards in aircraft maintenance and overhaul hangars. The nine terminal supervisors and the ramp supervisors also are alert to sanitation practices and conscientious about them.

Donovan has public education duties, too, as when he is requested by Consumer Service Building tenants to be a member of the welcoming committee at formal openings. His task is to acquaint the public with the sanitation features of the particular establishment being featured and of the terminal in general. He also consults with the representatives of the various unions representing organized labor employed at the airport.

Occasionally he acts as a guide, particularly on tours to flight kitchen operations.

When Donovan learns of protracted delays in flights owing to mechanical or weather conditions, and when high temperatures indicate possible spoilage of food without refrigeration, he orders food removed and replaced.

On one occasion, he observed and reported mosquito breeding on a roof area of the new terminal. Faulty construction had prevented drainage. The port authority corrected the condition.

The three main groups dealt with in respect to the airport sanitation, the terminal management, the airlines, and the tenants of the terminal, offer abundant evidence of their cooperation with the county health department.

The terminal management leases each of the two sets of triturator rooms to separate aircraft servicing companies operating on the field. In the contract it inserted at the request of the health department a requirement that each set of rooms have an attendant on duty for cleaning them and assisting operators of soil carts in dumping. Rooms are manned between peak hours of 8:00 a.m. to 5:00 p.m.

The port authority maintenance department promptly removes any rodent, fly, or mosquito breeding area on discovery by the health department.

Port authority regulations accept health department standards regarding the type and construction of garbage and rubbish hauling and storage equipment and mobile industrial feeding vehicles.

The management submitted for review by the health department the contract leasing concession for the cleaning and maintenance of the public areas of the terminal.

The management requires food and drink concessionaires to seek a health department review of their plans before they set up for business. It consults with the health department on all new or added construction.

The airline companies requested assistance of the county health department in the construction and design of potable water carts, potable water transferral systems, soil carts, food and drink equipment for aircraft use, and the sanitary maintenance of watering points and servicing areas.

Food and drink establishments bring in plans for construction and installation of equipment, and work with the department in training food handlers.

### Unfinished Business

With an eye to future developments and to the principles of design and operation of airports, the following needs are indicated:

- Toilet facilities adequate for employees on the baggage concourse and on the piers.
- Storage space for supplies and equipment used by terminal cleaning contractors, a locker room for employees of the cleaning contractor, and convenient toilet facilities for such employees.

- Floor level waste basins to receive waste water from mops and heavy duty cleaning, in the absence of sewers.
- Hose bibs and drinking fountains along the baggage concourse.
- Hose bibs on ramps opening to ground transportation.
- Toilet facilities convenient for drivers in the taxicab pool.
- Suitable methods of moving garbage and waste from upper level to lower level holding and storage area.

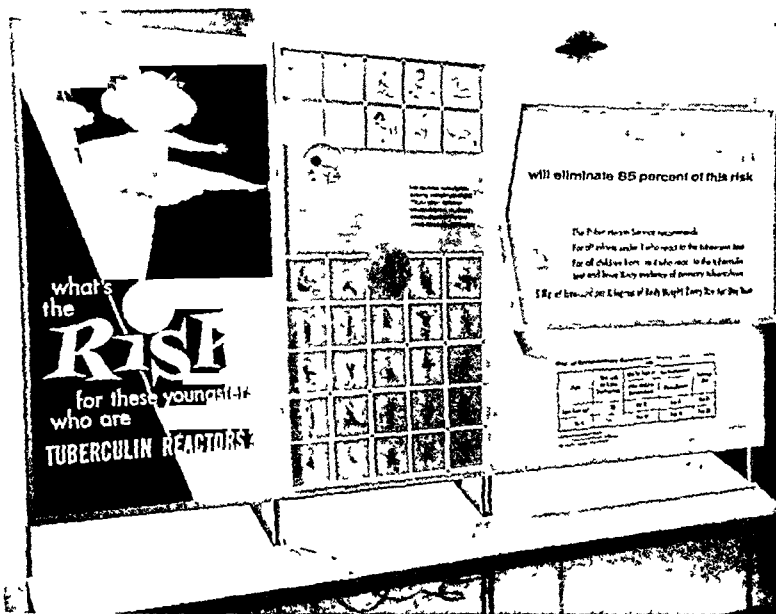
- Facilities convenient for washing and sanitizing waste receptacles from aircraft galleys.
- A means of barring stray dogs from the airport and terminal buildings, and of barring all dogs, except Seeing Eye dogs, from eating and drinking places.
- Suitable food service for employees on the piers.
- A method of keeping out of the air-conditioning system the mists of oil released from jet engines. Films formed by the oil soil the terminal and contaminate the air unnecessarily.

## exhibit

### What's the Risk for Youngsters Who Are Tuberculin Reactors?

Practically all the complications of primary tuberculosis can be prevented by the administration of isoniazid to infants and young children who are tuberculin positive. Because of the seriousness of the complications and of the demonstrated high risk, the Tuberculosis Program of the Public Health Service is recommending isoniazid prophylaxis for those infants and young children with special susceptibility. This exhibit is one of the means by which the program is making the recommendations known to physicians concerned with child health.

The information presented is based on a control study of 2,750 children, made by the Public Health Service in cooperation with pediatricians in 33 clinics throughout the United States. The study established that for children under 4 years who have asymptomatic primary tuberculosis the risk of extrapulmonary complications is high and that isoniazid prevents almost all of these complica-



Specifications: A 3-panel exhibit on legs, fabricated of translucent Fiberglas and plywood with aluminum framing, 9 feet long, contained in 2 crates, shipping weight 440 pounds. One electrical outlet, 110 a.c., 1,000 watts, is needed for illumination.

tions. These findings as well as specific recommendations for preventive treatment are shown in the exhibit and are presented in an accompanying pamphlet which is provided free for distribution to physicians.

The exhibit is available without charge for display at national, regional, and other meetings or conferences of physicians concerned

with child health. However, it must be manned by a physician and its availability will depend on whether this service can be obtained. Shipping costs for the exhibit must be paid by the borrower.

For further information write to the Tuberculosis Branch, Division of Special Health Services, Public Health Service, U.S. Department of Health, Education, and Welfare.

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# Mortality and Economic Level in an Urban Area

MARY ELLEN PATNO, Ph.D.

**D**URING the past century the association between mortality and economic status has been investigated repeatedly, and the same general conclusion has been reached—that the rate of mortality tends to vary inversely with the economic level of the community or population. Concomitantly, it has been believed and often demonstrated that morbidity also varies inversely with economic level. Within the past 5 years, however, at least three studies have been reported which suggest that the relationship no longer holds with respect to total illness. Graham, using occupation as the index of socioeconomic status, found no difference in the incidence of illness among six classes within Butler County, Pa., in 1954 (1). Laughton and associates made a similar observation among families of Windsor, Ont. Here families were classified into three groups according to the median rental of the census tract of residence, and illnesses were recorded for some 2-year period during the time between January 1948 and June 1953 (2). The third study compared families known to a public agency for reasons other than ill health with the remaining families of a community. Although members of the first group were of lower occupational status and educational attainment than members of the second group, they did not experience a greater incidence of illness in May 1952 or of hospitalization during the previous year (3).

In view of the reports that contradict the tra-

ditional inverse relationship with respect to illness, the study reported here and based on the examination of the 1940 and 1950 mortality among white residents of Pittsburgh, Pa., may be of some interest. This study contains no evidence that an inverse relationship no longer exists between economic level and mortality, but it does suggest a possible association of mortality with changes in the relative economic levels of residential areas.

Many of the published reports of the association between economic status and mortality have been based on the characteristics of the population in some geographic unit in which the decedent lived. Illustrative studies are those of Dorn (4), Altenderfer (5), and Lilienfeld (6). Dorn used counties as the basic geographic unit; Altenderfer used cities of at least 100,000; and Lilienfeld used census tracts. This study also employs the census tract as the basic unit.

## Relative Economic Levels

The 1940 white population was subdivided into three economic groups, in the following manner. The census tracts, ranging in population from fewer than 100 to more than 10,000 white persons, were ranked in ascending order of the median value of owner-occupied units (7). The 55 tracts with the lowest values were preliminarily designated as of lowest economic status, the next 69 tracts as of medium status, and the remaining 70 tracts as of high economic status. Each group contained approximately one-third of the white population of Pittsburgh. Using the median monthly rental as the index of economic status, the procedure was repeated and the two results compared (table

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*Dr. Patno is an associate professor in biostatistics, School of Public Health, University of Michigan, Ann Arbor. She was formerly with the department of biostatistics, University of Pittsburgh Graduate School of Public Health, Pittsburgh, Pa.*

# Academy of Medical Sciences of the USSR

A great volume of research in medicine and biology has been built up in recent years by Russian scientists. To a considerable degree, this achievement has been due to a consolidation of effort under the auspices of the largest medical and scientific institution in the USSR, the Academy of Medical Sciences.

At present, the Academy has a staff of approximately 10,000, and its yearly budget is nearly 300 million rubles (\$30 million at the tourist rate). The research work is supervised by some 250 active and corresponding members of the Academy. Membership in the Academy is the highest scientific rank in the field of medicine in the USSR.

This monograph presents the history, organization, and functioning of the Academy, its scientific-medical background, and its progress in medical research, covering the 15 years from the Academy's founding in 1944 to 1959. The chapter on organization describes the structure of the Academy of Medical Sciences and its relationship to the Ministry of Health and other organizations. It tries to make clear the internal organization of the departments, institutes, and administrative bodies.

The Academy's policies regarding personnel,

training and degrees, academic standing, and salaries are discussed to the extent that it was possible to gather information from Soviet and other sources. In addition to describing the administration and organization of the Academy, this monograph aims to show the chief areas of medical research in which it is engaged.

The Soviet Government, which finances and controls all scientific work in the USSR, relies to a great extent on plans prepared by the Academy. Its objectives for the Academy under the current 7-year plan, as presented by the Soviet press, are discussed.

Appendixes list all research institutes of the Academy as of January 1959, with locations and names of the directors, and provide a directory of all active and corresponding members of the Academy, giving the dates of their birth and election to the Academy, respective areas of research, and location.

This study is intended for physicians, medical workers, and others interested in the organization of medical research in the Soviet Union. Although it is based primarily on Soviet sources, American and other literature was also consulted. A special effort has been made to bring all information as up to date as possible.

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## Public Health Monograph No. 63

**Academy of Medical Sciences of the USSR, History and Organization, 1944-59.** By Galina V. Zarechnak. Public Health Monograph No. 63 (PHS Pub. No. 702), 48 pages. U.S. Government Printing Office, Washington, D.C., 1960.

The accompanying summary covers the principal contents of Public Health Monograph No. 63. published concurrently with this issue of *Public Health*

*Reports.* The author is with the National Library of Medicine, Public Health Service.

Readers wishing the data in full, official agencies, and others directly concerned may obtain single sample copies without charge from the Public Inquiries Branch, Office of Information, Public Health Service. Copies will be found also in the libraries of professional schools and the major universities and in selected public libraries.

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1). When home value and monthly rental indicated the same relative level (155 tracts with 81 percent of the population), the tract was assigned that position. When the two indices indicated different levels (39 tracts with 19 percent of the population), the tract was assigned the level indicated by the index based on the greater number of units. For example, if owner-occupied units outnumbered tenant-occupied units, the tract was assigned the level obtained when the median home value served as the index. When tenant-occupied units outnumbered owner-occupied units, the tract was classified according to the level indicated by the median monthly rental. The final classification was:

<i>Economic status</i>	<i>Census tracts</i>	<i>Population</i>
Low -----	59	197, 884
Middle -----	66	206, 530
High -----	69	204, 822

The subdivision of the 1950 population was carried out in a similar manner but with one additional index—median family income (8). The levels of 83 tracts with 48 percent of the population were determined by all three indices indicating the same level. For 104 tracts with another 48 percent of the population, 2 of the 3 indices indicated the same economic level, and the tracts were so assigned. The remaining seven tracts were designated as being of medium economic status. The final result was:

<i>Economic status</i>	<i>Census tracts</i>	<i>Population</i>
Low -----	70	199, 647
Middle -----	62	196, 396
High -----	62	197, 782

**Table 1. Economic status of white population of Pittsburgh, Pa., according to value of owner-occupied homes and median monthly rental value, 1940**

Value of owner-occupied homes	Median monthly rental value						Total	
	Lower third		Middle third		Upper third		Number census tracts	Population
	Number census tracts	Population	Number census tracts	Population	Number census tracts	Population		
Lower third-----	40	151, 137	15	50, 959	-----	-----	55	202, 096
Middle third-----	15	47, 495	51	148, 309	3	7, 105	69	202, 909
Upper third-----	1	1, 147	5	9, 278	64	193, 806	70	201, 231

**Table 2. Number of census tracts in Pittsburgh, Pa., by relative economic level, 1940 and 1950**

1940	1950			Total
	Low	Middle	High	
Low-----	48	9	2	59
Middle-----	21	38	7	66
High-----	1	15	53	69
Total-----	70	62	62	194

All but 55 of the tracts had the same relative classification in 1950 as in 1940. For 52 of these that "changed," the 1950 classification was one step from the 1940 classification. Two tracts were classified in the lower third in 1940 and in the upper third in 1950. One tract "changed" from the upper third in 1940 to the lower third in 1950 (table 2).

In later comparisons, the one tract which in 1940 was in the upper third but declined to the lower third in 1950 was combined with the 21 tracts that were of the middle third in 1940 but of the lower third in 1950. The 1940 population of this tract was 860; the 1950 population, 850. Similarly, the 2 tracts, with a combined population of 2,554 in 1940 and 2,924 in 1950, which were in the lower third in 1940 but advanced to the upper third in 1950 were grouped with the 7 tracts which advanced from the middle third to the upper third from 1940 to 1950.

#### Change in Population

From 1940 to 1950, there was a considerable shift in the white population and also a net loss

of 21½ percent. Not all areas, however, lost population. Losses occurred only in the aggregate areas which were of middle or low economic status in 1940 and remained at these levels in 1950. The population increased in each of the aggregate areas of high economic status in 1940 or 1950 (table 3).

A "cohort" comparison of the 1940 and 1950 population within each group showed that net out-migration, rather than death, was the major reason for the observed losses. Net in-migration was evident in the three groups that increased in population.

The census tracts which were of low economic status in both 1940 and 1950 illustrate net out-migration. In 1940, there were 11,779 children under 5 years of age in these tracts. In 1950, however, there were only 9,038 children between 10 and 15 years of age in these same tracts, a loss of 23.3 percent. This loss was more than 10

times that which would have occurred through death, and net out-migration is therefore indicated. Furthermore, every 5-year age cohort showed at least a 25 percent loss in population.

In the areas with larger populations in 1950 than in 1940, there were definite indications of net in-migration of young persons. For example, in the group that rose from the middle to the high level, there was net in-migration of males who were between 25 and 40 years of age in 1950 and of females between 20 and 35 years old. Areas of high economic status in both years gained in males between 10 and 40 years of age in 1950 and in females between 10 and 30 years old. Similar gains occurred in the group which fell from high to middle economic level.

#### Source of Mortality Data

Mortality data were obtained from the death certificates for white residents who died within

**Table 3. Population of Pittsburgh, Pa., by change in relative economic level of census tracts between 1940 and 1950**

1940 level	1950 level	Males			Females		
		1940	1950	Percent change	1940	1950	Percent change
Low-----	Low-----	84,921	68,882	-18.9	80,717	67,549	-16.3
	Middle-----	15,524	14,648	-5.7	15,028	14,941	-.6
Middle-----	Low-----	32,955	30,977	-6.0	32,632	32,239	-1.2
	Middle-----	61,926	58,896	-4.9	64,115	62,365	-2.7
High-----	High-----	8,775	9,731	+10.9	8,681	9,906	+14.1
	Middle-----	18,641	21,395	+14.8	21,484	24,151	+12.4
	High-----	76,049	83,432	+9.7	87,788	94,713	+7.9

**Table 4. Deaths in 1957 among white residents of Pittsburgh, Pa., by place of occurrence and economic level in 1950**

Place of death	Economic level of census tract, 1950					
	Low		Middle		High	
	Number	Percent	Number	Percent	Number	Percent
All places-----	2,380	100.0	2,060	100.0	2,229	100.0
Within the city-----	1,950	81.9	1,716	83.3	1,904	85.4
Outside the city-----	430	18.1	344	16.7	325	14.6
Within the county-----	385	16.2	291	14.1	243	10.9
In State and county institutions-----	333	14.0	196	9.5	125	5.6
Other-----	52	2.2	95	4.6	118	5.3
Other counties in Pennsylvania-----	30	1.3	31	1.5	37	1.7
Other States-----	15	.6	22	1.1	45	2.0

the city. These, then, did not represent all deaths among white residents, and it was necessary to assume that the degrees of incompleteness were the same for all economic groups. Data for more recent years on all resident deaths suggest that this may not have been an unreasonable assumption.

With the 1950 classification of census tracts being used, complete mortality data for 1957 showed that deaths outside the city accounted for 18 percent of the deaths among persons of the low economic level, 17 percent of the middle group, and 15 percent of the high group. One of the reasons for this slight inverse relationship is that the county and State institutions which provide care to the indigent of the city are located outside the city limits. And while the more well-to-do may seek care in nursing homes in the suburbs or in other States, this is counterbalanced by the less well-to-do using the public institutions (table 4).

There is, therefore, the possibility that in this report mortality among the lower economic groups was underestimated by a greater amount than mortality among the population of higher economic status, thus diminishing any inverse

relationship between mortality and economic levels that might exist.

Classification of the causes of death in both years was carried out under the principles of the sixth revision of the International Statistical Classification of Diseases, Injuries, and Causes of Death.

### Mortality Ratios

The mortality experience of each subgroup was summarized in two "expected numbers," one for males and one for females. The 1940 expected numbers were computed in three stages, one for all persons under 40 years of age, one for the native-born, and one for foreign-born persons 40 years old and over. The area's specific death rates for the age groups under 10, 10-29, and 30-39 years were applied to the city's population, giving an expected number of deaths for persons under 40 years of age. The second and third expected values were obtained by applying the age-specific death rates for the age groups 40-49, 50-59, 60-69, and 70 and over to both foreign-born and native-born populations. Finally, the three expected values were summed, with the total becoming the expected number for the subgroup.

Table 5. Standardized mortality ratios among white residents of Pittsburgh, Pa., by economic level, 1940 and 1950

Sex and age (years)	Economic level						Total deaths in city	
	1940			1950			1940	1950
	Low	Middle	High	Low	Middle	High		
<i>Males</i>								
All ages-----	1 11	0 97	0 93	1 13	0 99	0 88	3, 447	3, 103
Under 10-----	1 14	98	84	1 19	1 05	73	287	230
10-29-----	1 13	86	1 02	95	1 16	90	169	61
30-39-----	1 43	88	73	1 48	83	64	154	81
40-49-----	1 17	1 14	67	1 31	85	85	337	272
50-59-----	1 23	89	93	1 23	1 04	75	652	534
60-69-----	1 08	97	98	1 08	98	92	813	872
70 and over----	99	98	1 03	1 04	98	97	1, 005	1, 050
<i>Females</i>								
All ages-----	1 14	1 00	93	1 06	1 05	91	2, 853	2, 528
Under 10-----	91	1 03	1 07	1 01	85	1 16	183	159
10-29-----	1 07	1 14	80	1 00	1 12	87	122	55
30-39-----	1 13	1 02	88	1 27	96	77	139	88
40-49-----	2 27	1 01	81	1 18	1 21	68	216	160
50-59-----	1 65	92	79	1 23	99	84	384	331
60-69-----	1 20	99	93	1 13	1 03	87	662	566
70 and over----	1 03	1 00	1 00	97	1 09	95	1, 117	1, 166

The distinction between foreign-born and native-born in the handling of the 1940 data was made for three reasons. First, the age-specific rates for the foreign-born were higher than those for the native-born; second, the foreign-born constituted one-third of the population 40 years of age or older; and third, the foreign-born were not equally distributed among the three economic levels.

The 1950 data did not permit the separation of foreign- and native-born since the age distribution of the two groups was not published by census tracts. (In 1950, less than 15 percent of those 40 years old or older were foreign-born.) Therefore, the 1950 expected numbers for a subgroup were obtained by applying the age-sex specific rates to the city's population, without consideration of country of birth.

Once an expected number of deaths for a subgroup was obtained, it was related to the observed number of deaths in the city as a whole. The resulting ratios are the bases of many of the comparisons presented. Other comparisons are presented in terms of the ratios obtained from relating the age-specific rate for a subgroup to the corresponding age-specific rate for the city.

### Mortality and Economic Level

In both 1940 and 1950, an inverse relationship between economic level and mortality was found (table 5). In general, the highest mortality occurred among persons within the areas designated as being of low economic level, and the most favorable experience was found among the residents of the areas of high economic

**Table 6. Mortality ratios among white residents of Pittsburgh, Pa., by cause of death and economic level, 1940 and 1950**

Cause of death	Economic level						Total deaths in city	
	1940			1950				
	Low	Middle	High	Low	Middle	High	1940	1950
<i>Males</i>								
All causes.....	1. 11	0. 97	0. 93	1. 13	0. 99	0. 88	3, 447	3, 103
Tuberculosis.....	1. 65	. 77	. 51	1. 70	. 98	. 30	121	71
Other infective and parasitic diseases.....	. 99	1. 10	. 90	1. 04	1. 14	. 82	40	19
Malignant neoplasms.....	1. 05	. 99	. 99	1. 02	. 92	1. 05	383	426
Diabetes.....	1. 28	1. 04	. 73	1. 10	. 89	1. 02	69	47
Diseases of the nervous system and sense organs.....	. 99	. 94	1. 06	1. 01	. 91	1. 07	344	321
Diseases of the circulatory system.....	. 95	1. 00	1. 05	1. 05	1. 04	. 92	1, 321	1, 372
Diseases of the respiratory system.....	1. 23	1. 13	. 68	1. 67	1. 02	. 25	261	94
Diseases of the digestive system.....	1. 38	. 75	. 94	1. 28	. 82	. 86	200	135
Diseases of the genitourinary system.....	1. 10	1. 00	. 85	. 92	1. 04	1. 06	111	74
Accidents.....	1. 46	. 92	. 71	1. 29	1. 00	. 71	236	141
Suicide.....	1. 25	. 95	. 81	. 91	. 69	1. 39	51	45
Homicide.....	1. 12	1. 10	. 92	. 71	1. 57	. 74	11	8
All other.....	1. 25	. 89	. 88	1. 41	. 98	. 58	299	350
<i>Females</i>								
All causes.....	1. 14	1. 00	0. 93	1. 06	1. 05	0. 91	2, 853	2, 528
Tuberculosis.....	1. 25	. 89	. 94	1. 56	. 85	. 65	68	36
Other infective and parasitic diseases.....	1. 84	. 97	. 56	. 90	. 65	1. 44	18	14
Malignant neoplasms.....	. 94	1. 00	1. 06	. 90	1. 09	1. 00	383	437
Diabetes.....	1. 56	1. 00	. 68	. 92	1. 13	. 97	94	83
Diseases of the nervous system and sense organs.....	1. 10	1. 05	. 91	1. 14	. 92	. 96	363	396
Diseases of the circulatory system.....	1. 08	1. 00	. 96	1. 07	1. 08	. 88	1, 158	1, 068
Diseases of the respiratory system.....	1. 12	1. 06	. 90	1. 39	1. 07	. 63	232	52
Diseases of the digestive system.....	1. 33	. 97	. 84	1. 23	1. 18	. 64	131	103
Diseases of the genitourinary system.....	1. 48	1. 23	. 47	1. 40	. 99	. 65	84	41
Accidents.....	1. 42	. 88	. 80	1. 07	1. 21	. 76	88	61
Suicide.....	. 51	. 77	1. 32	1. 16	1. 34	. 52	12	16
Homicide.....	1. 20	1. 03	. 77	2. 61	. 60	. 00	3	5
All other.....	1. 25	. 83	. 99	. 98	1. 00	1. 03	219	213

status. Exceptions to the inverse relationship were found in several of the age groups, the most noticeable, in both 1940 and 1950, being that of childhood mortality among females. The highest mortality among females under 10 years of age occurred in the areas of high economic status.

Causes of death which followed the pattern of the overall ratios in both 1940 and 1950 were tuberculosis (male), diseases of the respiratory system (male and female), diseases of the digestive and genitourinary systems (female), and accidents among males (table 6). The frequency of these causes of death have at one time or the other been found to be related to economic status.

When the populations of the two extreme economic levels were compared, that is, the low with the high, there was no question that the former demonstrated the greater mortality. With but two exceptions, females under 10 years of age in both 1940 and 1950 and males 70 years old and older in 1940, all age-specific death rates were higher in the low economic

group. In 1950, the greatest relative differential was observed for males in the age group 30-39. The death rate in the low economic group was 2.8 per 1,000 and exceeded that in the high group by 135 percent. The next highest relative differential was among females 40-49 years of age, with women of the low economic group experiencing a rate of 4.6 per 1,000, 75 percent above the high group. Practically all age-adjusted rates by cause of death were also higher among the populations of the poorer tracts. The few exceptions included cancer among females, the ratios being 0.94 to 1.06 in 1940 and 0.90 to 1.00 in 1950. Among males, the exceptions were diseases of the nervous system and sense organs in both years, diseases of the circulatory system in 1940, and cancer and diseases of the genitourinary system in 1950.

#### Mortality and Change in Economic Level

Additional information on the relationship between economic level and mortality was suggested when each of the three groups of the

Table 7. 1940 mortality ratios among white residents of Pittsburgh, Pa., by age and change in relative economic level

Sex and age (years)	1940 level								Total deaths in city
	Low		Middle			High			
	1950 level		1950 level			1950 level			
	Low	Middle	Low	Middle	High	Middle	High		
<i>Males</i>									
All ages	1.16	0.86	1.06	0.95	0.87	1.12	0.89	3,447	
Under 10	1.27	.59	1.04	1.01	.45	1.12	.78	287	
10-29	1.08	1.37	.87	.85	.88	1.80	.82	169	
30-39	1.59	.61	1.30	.75	.22	1.18	.62	151	
40-49	1.22	.86	1.27	1.11	.88	.74	.66	337	
50-59	1.28	.91	.90	.84	1.33	1.15	.87	652	
60-69	1.11	.86	.99	.96	1.02	1.16	.94	843	
70 and over	1.01	.86	1.14	.98	.67	1.07	1.02	1,005	
<i>Females</i>									
All ages	1.15	1.09	.89	1.08	.80	1.18	.86	2,853	
Under 10	.94	.76	.70	1.19	1.10	2.20	.81	183	
10-29	1.11	.90	1.02	1.26	.64	1.09	.73	122	
30-39	1.20	.78	.88	1.23	.00	.76	.91	139	
40-49	1.28	1.21	.90	1.04	1.12	1.47	.63	246	
50-59	1.44	1.15	.80	1.01	.61	.92	.75	381	
60-69	1.21	1.12	.90	1.07	.82	1.14	.87	862	
70 and over	1.01	1.14	.92	1.05	.85	1.11	.97	1,117	

1940 population was subdivided by considering simultaneously both the 1940 and 1950 relative levels of each census tract.

The population of the low economic group in 1940 was divided into two components: (a) those persons who lived in tracts whose 1950 classification was also low and (b) those persons in tracts which were of higher level in 1950. Similarly, the population in the middle level group was considered in three parts: (a) persons in the areas with a low classification in 1950, (b) persons in areas of middle level in 1950, and (c) persons in areas with a high 1950 classification. Finally, the population living in areas of high economic level in 1940 was divided between those who lived in sections that were of high economic level in the 1950 classification

and those who lived in sections that were at a lower level in 1950. These seven groups have already been indicated in tables 2 and 3, and table 7 summarizes the 1940 mortality experience of the populations in the seven areas.

The most favorable experience in 1940 occurred in the areas which were to rise in relative economic level or to remain at the high level. The least favorable experience occurred in the areas which were to fall in relative economic level or to remain at the low level.

The experience of the men who lived in areas which were to advance economically in relative terms was particularly favorable, equaling that for men in the sections which ranked high in economic level in both 1940 and 1950. Much of this favorable experience was related to the

Table 8. 1940 mortality ratios among white residents of Pittsburgh, Pa., by cause of death and change in relative economic level

Cause of death	1940 level							Total deaths in city
	Low		Middle			High		
	1950 level		1950 level			1950 level		
	Low	Middle	Low	Middle	High	Middle	High	
<i>Males</i>								
All causes.....	1.16	0.86	1.06	0.95	0.87	1.12	0.89	3,447
Tuberculosis.....	1.70	1.43	1.10	.67	.40	.96	.41	121
Other infective and parasitic diseases.....	1.18	.00	1.43	.72	3.52	.80	.93	40
Malignant neoplasms.....	1.06	1.01	.87	1.04	1.29	1.05	.98	383
Diabetes.....	1.31	1.07	1.01	.95	2.87	1.35	.59	69
Diseases of the nervous system and sense organs.....	1.09	.44	.97	.92	1.18	1.25	1.00	344
Diseases of the circulatory system.....	.96	.85	1.04	1.02	.83	1.16	1.03	1,321
Diseases of the respiratory system.....	1.33	.70	1.54	.98	.80	.93	.61	261
Diseases of the digestive system.....	1.44	1.05	.75	.82	.25	1.08	.89	200
Diseases of the genitourinary system.....	1.06	1.34	.80	1.15	.71	1.05	.78	111
Accidents.....	1.51	1.09	1.41	.73	.35	1.15	.60	236
Suicide.....	1.40	.37	1.36	.70	.92	1.58	.58	51
Homicide.....	1.33	.00	.00	1.84	.00	1.19	.91	11
All other.....	1.35	.79	1.02	.86	.55	1.00	.86	299
<i>Females</i>								
All causes.....	1.15	1.09	0.89	1.08	0.80	1.18	0.86	2,853
Tuberculosis.....	1.00	2.62	1.32	.72	.72	.99	.94	68
Other infective and parasitic diseases.....	1.90	1.42	.43	1.28	.00	2.13	.21	18
Malignant neoplasms.....	.93	.98	.83	1.13	.47	1.24	1.01	383
Diabetes.....	1.53	1.78	1.02	1.01	.83	.80	.65	94
Diseases of the nervous system and sense organs.....	1.12	1.02	.88	1.11	1.28	1.00	.88	363
Diseases of the circulatory system.....	1.09	1.08	.89	1.09	.71	1.16	.91	1,158
Diseases of the respiratory system.....	1.22	.53	.86	1.14	.50	1.40	.77	232
Diseases of the digestive system.....	1.28	1.78	1.07	.98	.42	1.17	.76	131
Diseases of the genitourinary system.....	1.56	.92	.89	1.37	2.25	.64	.44	84
Accidents.....	1.49	1.04	.75	.87	1.65	.96	.74	88
Suicide.....	.36	1.43	.91	.78	.00	1.87	1.17	12
Homicide.....	1.43	.00	.00	1.57	.00	.00	.97	3
All other.....	1.30	1.00	.73	.96	.16	1.63	.81	219

fact that the lowest rates for diseases of the circulatory system were observed in these areas (ratios=0.85 and 0.83).

In the areas which were to decline from the middle level in 1940 to the low level in 1950, several causes of death among men were of interest in that they are ones usually associated with lower economic levels. First of all, the ratio for mortality from diseases of the respiratory system was the highest of all groups, even exceeding that among men of the areas that would remain in the low level in 1950 (table 8). The ratios for accidental death and suicide were also high.

With one exception, the data for females followed the pattern of males, that is, the most favorable experience was found among the residents of areas which were to advance to or remain in the upper level in 1950. The exception was among women in the areas classified in the middle level in 1940 and in the low level in 1950. While the men of these areas exhibited a mortality which was 6 percent higher than that for all men in the city, the women experienced a mortality which was 11 percent lower

than that for all women. Their advantage involved all age groups except the 10-29-year group and all causes of death except tuberculosis, diabetes, and diseases of the digestive system.

In order that the 1950 mortality could be viewed in terms of the past relative economic level of areas as well as the current relative economic level, the 1950 population was subdivided by considering both the 1940 and 1950 relative levels of each census tract. In other words, subgroups of the population and their mortality experiences were analyzed with respect to the current relative level of census tracts (1950) and the past relative level of the tracts (1940). Table 9, based on the 1950 mortality, shows ratios for each of the subgroups and again demonstrates a negative association between economic level and mortality. When compared with table 7, it also suggests that the relative level of the past is of less importance than the relative level of the future with respect to current mortality. For example, within each major group the ratios for the two or three components are more alike in table 9 than in table 7.

Table 9. 1950 mortality ratios among white residents of Pittsburgh, Pa., by age and change in relative economic level

Sex and age (years)	1940 level							Total deaths in city
	Low		Middle			High		
	1950 level		1950 level			1950 level		
	Low	Middle	Low	Middle	High	Middle	High	
<i>Males</i>								
All ages.....	1.12	1.14	0.91	0.98	1.03	0.98	0.88	3,103
Under 10.....	1.21	1.13	.85	1.21	.71	1.22	.66	230
10-29.....	.76	1.34	.55	1.17	1.51	.45	.95	61
30-39.....	1.48	1.46	1.12	.77	.80	.99	.60	84
40-49.....	1.33	1.26	.78	.98	.54	.53	.88	272
50-59.....	1.28	1.12	1.33	.88	1.30	.96	.73	534
60-69.....	1.09	1.08	.81	1.01	1.01	.69	.94	872
70 and over.....	1.00	1.13	.83	.97	1.08	1.00	.97	1,050
<i>Females</i>								
All ages.....	1.04	1.11	1.05	1.06	1.02	.97	.91	2,528
Under 10.....	.88	1.30	1.32	.83	.52	.17	1.30	159
10-29.....	1.07	.87	1.30	1.10	1.03	1.06	.85	58
30-39.....	1.51	.75	.22	1.29	.59	.32	.82	88
40-49.....	1.25	1.05	1.37	1.22	1.11	.37	.71	160
50-59.....	1.17	1.36	.96	1.12	.66	.92	.83	331
60-69.....	1.11	1.15	1.15	.96	1.15	1.25	.84	566
70 and over.....	.93	1.05	1.00	1.07	1.15	1.09	.94	1,166

Table 10 is also based on the 1950 mortality and gives added evidence that tuberculosis and diseases of the respiratory system were still good indicators of economic level in spite of their relative unimportance numerically in the total mortality picture.

#### Decrease in Mortality from 1940 to 1950

Between 1940 and 1950, all areas experienced a decrease in mortality rates. The decrease, however, was not at a uniform rate. In table 11, equal ratios for the years 1940 and 1950 mean a relative decrease in mortality equal to that seen in the city as a whole. Since a 1950 ratio smaller than its corresponding 1940 ratio means a decrease exceeding that observed in the

entire city, the greatest proportional decreases occurred in the two areas of highest mortality in 1940. These were (a) the areas which were of low economic level in both 1940 and 1950 and (b) the areas which were in the high level in 1940 but in the middle level in 1950. One of the smallest proportional decreases occurred in the census tracts classified at the middle level in 1940 and at the low level in 1950.

#### Summary and Discussion

1. On the basis of data on median home value, monthly rental, and family income by census tract, the 1940 and 1950 white populations of Pittsburgh, Pa., were divided into three economic groups referred to as the lower

Table 10. 1950 mortality ratios among white residents of Pittsburgh, Pa., by cause of death and change in relative economic level

Cause of death	1940 level							Total deaths in city
	Low		Middle			High		
	1950 level		1950 level			1950 level		
	Low	Middle	Low	Middle	High	Middle	High	
<i>Males</i>								
All causes.....	1.12	1.14	0.91	0.98	1.03	0.98	0.88	3,103
Tuberculosis.....	1.58	1.96	.95	1.16	.55	.36	.27	71
Other.....	1.28	.50	1.24	1.29	.63	.00	.90	19
Malignant neoplasms.....	1.09	.78	.88	.94	.91	1.34	1.03	426
Diabetes.....	1.15	.97	1.52	.88	.57	.00	1.12	47
Diseases of the nervous system and sense organs.....	1.01	1.01	1.18	.85	.97	.91	1.09	321
Diseases of the circulatory system.....	1.05	1.05	.83	1.00	1.24	.96	.92	1,372
Diseases of the respiratory system.....	1.73	1.52	2.56	.90	.41	.34	.24	92
Diseases of the digestive system.....	1.53	.73	1.16	.72	.88	.28	.92	135
Diseases of the genitourinary system.....	1.06	.60	.23	1.17	1.08	.55	1.10	74
Accidents.....	1.07	1.77	.55	1.28	.56	1.10	.66	141
Suicide.....	.66	1.43	.60	.67	.89	.72	1.46	45
Homicide.....	1.00	.00	2.65	1.90	.00	.00	.80	8
All other.....	1.21	1.84	.56	1.07	1.00	.58	.57	350
<i>Females</i>								
All causes.....	1.04	1.11	1.05	1.06	1.02	.97	.91	2,528
Tuberculosis.....	1.53	1.64	.92	.97	.35	.94	.64	36
Other infective and parasitic diseases.....	.65	1.42	1.74	.69	.86	.00	1.59	14
Malignant neoplasms.....	.88	.91	1.03	1.00	1.29	.69	1.03	437
Diabetes.....	.87	1.03	1.26	1.15	1.00	2.05	.91	83
Diseases of the nervous system and sense organs.....	1.06	1.29	.66	1.03	.77	1.02	.96	396
Diseases of the circulatory system.....	1.09	1.03	1.15	1.09	1.02	1.21	.86	1,068
Diseases of the respiratory system.....	1.27	1.65	1.82	.77	1.56	.76	.63	52
Diseases of the digestive system.....	1.11	1.53	1.61	1.21	.89	.42	.66	103
Diseases of the genitourinary system.....	1.61	.95	.59	1.10	.85	.00	.70	41
Accidents.....	.66	1.93	1.01	1.10	1.75	.53	.78	64
Suicide.....	1.73	.00	1.22	1.56	.79	1.96	.35	16
Homicide.....	2.86	2.10	.00	.00	2.28	.00	.00	5
All other.....	.95	1.01	1.11	1.00	.83	.49	1.13	213



**Table 11. Mortality ratios among white residents of Pittsburgh, Pa., by change in relative economic level, 1940 and 1950**

1940 level	1950 level	Males		Females	
		1940	1950	1940	1950
Low-----	Low-----	1.16	1.12	1.15	1.04
	Middle-----	.86	.91	1.09	1.05
Middle-----	Low-----	1.06	1.14	.89	1.11
	Middle-----	.95	.98	1.08	1.06
	High-----	.87	.98	.80	.97
High-----	Middle-----	1.12	1.03	1.18	1.02
	High-----	.89	.88	.86	.91

one-third, the middle one-third, and the upper one-third, and the census tracts in which these groups lived were classified into low, middle, and high economic levels.

2. Mortality data for the 2 years were analyzed. In both instances a negative association between economic level and mortality was shown.

3. In both years, the frequency of deaths from certain causes appeared to be closely related to economic level. The causes were tuberculosis, diseases of the respiratory system, and accidents among men, and deaths from diseases of the respiratory, digestive, and genitourinary systems among women.

4. The relative differentials between the low and high groups were just as great in 1950 as in 1940 for the age groups covering the years 30 through 69.

5. In general, the census tracts which improved in relative economic level from 1940 to 1950 had a lower mortality in 1940 than those tracts whose relative economic levels remained unchanged or decreased from 1940 to 1950. This suggests an association between the 1940 mortality and the "future" relative economic level (1950) of the census tracts.

6. The 1950 mortality data were analyzed in terms of the current (1950) and past (1940) relative economic levels of the census tracts, and no association was found between the 1950 mortality and the past relative economic levels of the census tracts.

These findings point up the fact that currently in a large modern city, the well-established phenomenon of differences in mortality

among economic classes still is in evidence. Both in 1940 and 1950, mortality was highest in the census tracts with the poorer populations and lowest in the census tracts characterized by populations with higher incomes. Practically all causes of death contributed to the economic differential mortality in these 2 years and, as expected, the inverse relationship between economic level and frequency of death from tuberculosis, respiratory disease, diseases of the digestive system, and accidents was particularly noteworthy.

A new feature of the relationship between economic level of the population and mortality was revealed by the finding that in 1940 those census tracts which were to rise in relative economic level between 1940 and 1950 had a lower mortality than the census tracts of the same or higher economic level whose relative economic level was not to improve between 1940 and 1950. It would seem, then, that a favorable mortality experience preceded or went hand in hand with an improvement in the relative economic level of census tracts. In order to understand the real meaning of this concomitance and the manner in which it occurred, one needs more detailed knowledge of the factors which brought about changes in the relative economic level of the census tracts and of the changes in other characteristics which accompanied the change in economic level.

In general, economic improvement or deterioration in urban areas is reflected in improvement or deterioration of the physical environment and in shifts of population groups. Either of these factors alone or jointly could have affected the mortality of 1940. The point to emphasize, however, is that even before the improvement in the economic level of an area was demonstrated, the area experienced low mortality. Another point which emerges from this study is that the systematic analysis of vital and health statistics in a community still offers many opportunities to explore the meaning of certain factors related to ill health.

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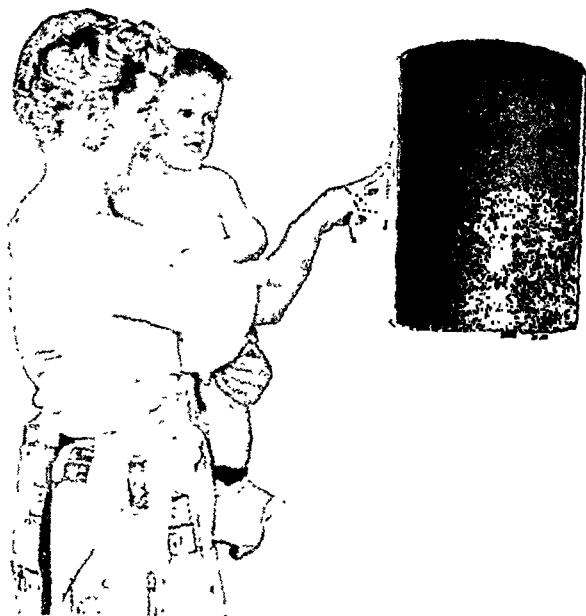
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*Address inquiries to the publisher or sponsoring agency.*



## Safe Medicine Cabinet

The lives of many children could have been saved in 1958 by a simple household cabinet, properly used.

The National Clearinghouse for Poison Control Centers reports that during 1958 there were 1,429 deaths from accidental ingestion of poisons. More than 400 of these were in children. In 80 percent of all poisoning cases occurring in the home, according to the National Clearinghouse, the items ingested were readily accessible.

In 1958, 14,069 cases of ingestion of hazardous substances were reported to the National Clearinghouse for Poison Control Centers, established in Washington in 1957 by the Public Health Service. Of these 14,069 cases, 90 percent were in children under 5 years of age. Actually, it is estimated that 500,000 cases of household poisoning occur annually.

Most frequent causes of child poisoning are the common aspirin—baby and regular—and kerosene. One or the other from year to year heads the list of fatalities from accidental poisonings. Drugs, led

by aspirin, caused 35 percent of the fatalities in children under 5 years in 1958.

Other common causes of accidental poisonings are barbiturates, bleach, turpentine, rodenticides, potassium permanganate, pine oil disinfectants, sanitizing agents, cleaning agents, furniture polish and floor wax, and insecticides such as roach paste.

Since most childhood poisonings are a result of the failure to keep dangerous chemicals out of reach of toddlers, there have been many efforts to develop a storage chest that a child will not be able to open, but that can be opened easily by an average person old enough to know a safe item from a dangerous one. Dr. A. L. Chapman, chief, Division of Special Health Services, Public Health Service demonstrated such a prototype medicine cabinet before the Plumbing Fixture Manufacturers Association at their meeting in Washington this year.

The cabinet, which Dr. Chapman was instrumental in developing, has an ingenious locking device, difficult for a child to open, but easy for an adult.

As shown in the illustration, the cabinet has five buttons, three of which are intended simply to confuse the child. Only the second and fourth, from top or bottom, pressed simultaneously, will open the cabinet. No other combination of buttons will work—and the second and fourth are placed too far apart for a child's hand to reach both at once.

Dr. Chapman claims that since the bathroom cabinet is usually cluttered with shaving equipment, cosmetics, and medicine, in most cases medicine is the first item to be moved elsewhere. He says that a desirable medicine cabinet "should be attractive, large, accessible—one which would invite its use." He conceives that such a cabinet might be placed in the kitchen rather than the bathroom, as he believes that much home medication takes place there.

As a result of the meeting of Public Health Service personnel with the Plumbing Fixture Manufacturers Association, a Medicine Cabinet Manufacturers Council was established and an Executive Committee appointed. This committee is negotiating to develop a set of standards for manufacturing such a cabinet.

# Accidental Poisoning as an Indication of High Accident Frequency

ROBERT S. McINNES, M.P.H., and DWIGHT M. BISSELL, M.D., M.S.P.H.

FOR THE PAST 2 years, the San Jose (Calif.) City Health Department has been testing the hypothesis that the occurrence of a case of accidental poisoning in a family is positively associated with a higher than average incidence of accidents of all kinds.

## Study Design

The hypothesis was tested through comparison of the accident experience of two groups of people, called the poison group and the control group. The poison group was made up of families in which one child had ingested, or gave reasonable evidence of having ingested, a chemical poison and had been treated at the San Jose City-County Emergency First Aid Station. The emergency first-aid station, with a physician and nurse on duty 24 hours a day, has an established reputation for the treatment of all types of injury, especially accidental poisoning.

Families in the poison group were entered in the study approximately a week after the occurrence of a poisoning accident. These 118 families were added from time to time during the entire 17 months of the study.

The control group was selected on the basis of one criterion—the family had at least one child under 5 years of age—since childhood poisonings happen almost exclusively to

children in this age group. The 80 families in the control group were selected within a 6-week period.

Preliminary geographic analysis of the location of previous emergency first-aid station poisoning cases indicated no pattern of clustering, but rather a seemingly randomized distribution throughout the city. Therefore, a systematic sample of all households in San Jose was taken from the city directory, supplemented by a similar sample from a list of residences in areas of new construction not covered by the directory.

To ascertain the presence of at least one child under age 5, the majority of families were screened by telephone. Families without a telephone were visited by the interviewer.

The family was defined as parents and children only. Other relatives or boarders living in the household were not included in the study.

An accident was defined as an unintended injury of any degree, regardless of place of occurrence, which could be recalled by the respondent, usually the housewife, for herself and other members of her family. The following information about the accident was recorded: how it happened, where it happened, time of occurrence, type of treatment, and resulting disability, if any. After the first visit, only the question about accidents in the preceding month was repeated.

Considerable effort was made to standardize the interviews. All interviewing was done by one person, the coordinator-interviewer. Questions and the interviewer's introduction to the householder were memorized. Both poison

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*Mr. McInnes is a health educator and study coordinator and Dr. Bissell is health officer, San Jose City Health Department. The study received financial support from the National Institutes of Health, Public Health Service.*

and control groups were approached in the same manner. The central hypothesis of the study was not mentioned, to avoid putting poison group families on the defensive.

All families were interviewed at monthly intervals. At the initial interview, each family was asked about accidents which had happened during the preceding month, the type of medical care received by children, the sex and age of each member of the family, the highest grade of school completed by adults, family income, and length of residence at the present address. Race or ethnic group of the family, type of residence, condition of dwelling unit, and neatness of housekeeping were noted by the interviewer.

Overall acceptance of the survey was good. There were no refusals to be interviewed the first time. About 1 out of 10 persons refused to be interviewed during some subsequent interview and dropped out of the study. Refusals were not grouped toward the beginning of the interviewing but were more or less evenly dis-

tributed throughout the entire 17 months of the study. In no calendar month were there more than three refusals.

As would be expected in a survey conducted over such a long period of time, a number of families were lost because of moving. Those families who moved within the city limits of San Jose, and who left a forwarding address, were continued in the study. About 25 percent of each group moved out of the study area. Some of these families had been interviewed a number of times before moving from San Jose.

### Findings

This study was designed with the idea of using the occurrence of an accidental poisoning as a method of finding families with a high accident incidence so that they could be given some form of special attention, such as a nursing visit. Based on this intended use of results, small differences in rates between poison and

**Table 1. Rates for three categories of accidents<sup>1</sup> and person-months for all accidents, January 1958-May 1959**

Month of study	Accident rates per 100 persons per month						Person-months	
	All accidents		All accidents within 1 week prior to interview		Home accidents			
	Poison	Control	Poison	Control	Poison	Control	Poison	Control
1958								
January							12	
February	26.1		13.0		13.0		23	
March	18.9	22.2	12.2	18.5	18.9	18.5	74	27
April	11.5	23.7	8.3	12.2	8.3	17.2	96	354
May								
June	14.9	22.6	8.5	11.1	11.2	14.1	188	199
July	19.6	24.5	9.2	13.2	18.4	18.9	163	212
August	18.7	27.6	8.6	15.0	15.3	19.3	209	254
September	18.0	9.5	9.8	3.3	12.8	4.8	133	210
October	20.3	17.6	5.5	8.2	14.8	12.7	291	245
November	18.5	21.8	6.8	5.6	14.4	14.0	222	179
December	18.2	13.6	8.4	5.7	11.7	11.4	154	88
1959								
January	15.5	15.1	6.8	6.8	11.6	11.1	336	252
February	14.7	22.5	4.7	9.6	12.3	17.6	211	187
March	25.6	15.6	10.5	10.1	20.0	17.3	285	179
April	18.9	13.7	7.9	8.6	15.4	9.6	228	197
May	24.4	22.4	13.7	9.9	19.2	11.8	234	152
Entire period	18.8	19.7	8.4	9.6	14.7	13.8	2,859	2,735

<sup>1</sup> Excluding original poisoning treated at San Jose City-County Emergency First Aid Station.

control groups, even if they could be conclusively demonstrated, would have little practical importance.

Table 1 shows three types of accident rates for each of the 17 months during which interviewing was done, the rate per person per month for the entire study period, and the number of person-months for all accidents for both poison and control groups. Because the poison group was chosen on the basis of the occurrence of an accident, this accident was omitted from the tabulation.

In order to test the likelihood of chance variation in the rate for all accidents for the total study period, for both poison and control groups, a test for confidence intervals was used with the monthly rate distribution. For the control group this test indicated that if every household in San Jose with a child under 5 years of age had been interviewed, there are 19 chances out of 20 that the mean rate for the entire group would have been between 16.8 and 22.2 per 100 person-months. Since the poison group was not a sample, such a test was inappropriate. However, should one assume that the time period of our study represents a random sample of the indefinite future, such a test would give us the likelihood 19 times out of 20 that the future poison mean rate would be between 16.8 and 21.0 per 100 person-months. Assuming that the means for the two groups are at opposite ends of the confidence intervals

(poison 21.0 and control 16.8, an unlikely assumption), the rate differences between the two groups would not seem to be large enough to warrant special attention for the poison group as a whole.

Analysis of the poison and control groups revealed slight differences on certain variables, such as age distribution, income distribution, and education. To see how these differences in population characteristics would affect accident rates, a standardized population technique was used. The effect of using such a technique with various differences in the two groups is shown in table 2.

This technique involved taking a specific rate for the poison group, age for example, and multiplying these rates by the actual proportionate distribution for this variable in the control group. This multiplication gave us a hypothetical number of accidents which would have occurred had the poison group had the same proportionate distribution as the control group for the variable under consideration. With this hypothetical accident total it was possible to produce a single accident rate which would be comparable to the observed rate for the control group. The age-adjusted rate is obtained by multiplying the poison rate by the control person-months for each age group and dividing the sum of the results by the sum of the control person-months.

Adjustment for differences in distribution of

**Table 2. Effect of applying various poison group rates to control group distribution**

	Accident rates per 100 persons per month		
	Poison group		Control group rate (actual)
	Actual	Adjusted	
Assume:			
Adjusted age distribution for—			
All accidents.....	18.8	17.9	19.7
Accidents within 1 week of interview.....	8.4	8.2	9.6
Home accidents.....	14.7	13.5	13.8
For all accidents—			
Same number interviews completed.....	18.8	18.1	19.7
Same distribution of—			
School grade completed by mother.....	18.8	18.8	19.7
Income.....	18.8	18.5	19.7
Rented and owned dwellings.....	18.8	17.8	19.7
Length of time resident at current address.....	18.8	17.6	19.7
Condition of dwelling units.....	18.8	18.6	19.7
Housekeeping neatness.....	18.8	18.0	19.7

and control groups were approached in the same manner. The central hypothesis of the study was not mentioned, to avoid putting poison group families on the defensive.

All families were interviewed at monthly intervals. At the initial interview, each family was asked about accidents which had happened during the preceding month, the type of medical care received by children, the sex and age of each member of the family, the highest grade of school completed by adults, family income, and length of residence at the present address. Race or ethnic group of the family, type of residence, condition of dwelling unit, and neatness of housekeeping were noted by the interviewer.

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rates were noted for age groups 1-2 years and 3-4 years.

Figures are available showing the location of greatest accident liability in the home. Excluding the original poisoning, for males in both poison and control groups the largest number of accidents occurred in the yard, with 22.2 percent of accidents in the poison group and 18.0 percent of those in the control group occurring there. For females in both groups, the kitchen was the most dangerous place; 22.3 percent of accidents in the poison group and 23.7 percent of those in the control group occurred in the kitchen.

As to the hour of the day of greatest accident liability, we see a peak from 10:00 a.m. to 12:00 noon, and another peak from 2:00 p.m. through 6:00 p.m. Accidents reported between these hours were coded to the nearest hour.

The degree of correlation of all accidents for poison and control groups, by month, was tested. The correlation was almost zero, indicating that seasonal variation, if it exists, is lost in random movement of the rates up and down by month.

During the course of the study, nine individuals in the poison group had a second accidental poisoning. Only one of these came to medical attention, being treated at the emergency first-aid station. Checking the cards of the nine individuals who had repeated poisoning against various poison group statistics

revealed no leads which would have helped to predict this recurrence. One control group family did have a case of accidental poisoning which was treated at the emergency first-aid station, and this family was transferred to the poison group. In the control group there were six additional cases of accidental poisoning which received no medical attention. Checking the six cases against various control group statistics revealed no leads which would help us to separate this group from the entire control group.

Considering the relatively low incidence of accidental poisoning, the fact of repetition of such an accident to the same individual in 9 cases out of 118 may be a major finding. However, this finding should be interpreted with caution. Let us assume that accidental poisoning of any form is randomly distributed and that the occurrence of one incident to a child does not influence the likelihood of the same child experiencing a subsequent poisoning. From these two assumptions, we would expect to have the same number of accidental poisonings per month per person in the susceptible age group in both the poison and control groups. Remember that we are assuming that the occurrence of the initial poisoning does not affect the likelihood of a subsequent poisoning. There are about 50 percent more person-months in the susceptible age group in the poison group than in the control group; thus we see that the

**Table 5. Rates for all accidents<sup>1</sup> and for home accidents, and person-months for all accidents, by age group**

Age group (years)	Rates per 100 persons per month				Person-months	
	All accidents		Home accidents		Poison	Control
	Poison	Control	Poison	Control		
Under 1.....	16.9	28.7	16.4	24.8	213	129
1-2.....	35.5	32.1	31.4	26.1	612	433
3-4.....	22.8	20.4	18.5	14.4	319	416
5-9.....	16.4	17.4	8.7	8.2	312	414
10-14.....	14.1	16.0	8.3	6.9	121	175
15-21.....	14.1	21.3	8.9	14.9	348	249
25-44.....	10.3	13.6	7.2	9.6	920	877
45-61.....		16.7		14.3	10	42
Not stated.....					4	
All ages.....	18.8	19.7	14.7	13.8	2,859	2,735

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population characteristics consistently reduced the poison accident rate, further detracting from accepting the hypothesis of increased accident incidence for the poison group. There was little difference in distribution of other variables, not shown in table 2, between the poison and control groups.

An analysis of accidents reported by each group on the basis of type of treatment and place of accident shows little difference between the two groups (tables 3 and 4). In order to discover whether or not similarities in gross overall rates were simply masking different individual accident liabilities, we analyzed the number of accidents which were reported during the first six interviews for individuals who were in the study for six interviews or more. The distribution of these accidents in the poison and control groups is practically identical.

Some family injury surveys, in which the

**Table 3. Percentage distribution of all accidents,<sup>1</sup> by type of treatment**

Type of treatment	Group	
	Poison	Control
None.....	26.3	24.8
First aid.....	62.4	64.1
Medical attendance.....	6.3	6.9
City-County Emergency First Aid Station.....	3.0	1.3
Hospital outpatient department.....	1.5	2.2
Hospital inpatient department.....	.2	.2
Not stated.....	.4	.5

<sup>1</sup> Excluding original poisoning treated at San Jose City-County Emergency First Aid Station.

**Table 4. Percentage distribution of all accidents,<sup>1</sup> by place of occurrence**

Place of occurrence	Group	
	Poison	Control
Own home.....	69.0	60.7
Other home.....	9.1	9.3
Work.....	4.4	5.5
School.....	3.9	3.1
Motor Vehicle.....	1.7	1.1
Public place.....	8.7	18.5
Not stated.....	3.2	1.7

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same families were interviewed over a period of time, showed a noticeable decline in their reporting of accidents. Whether this is due to an actual decline in the number of accidents, or to a decrease of interest in the study, has not been determined. Nevertheless, we were concerned with this question. In the poison group, individuals had fewer interviews than in the control group. To test the effect of fewer interviews on the accident rate, we used the adjusting technique mentioned above. The results are shown in table 2, which shows what would have happened had the poison group been selected and retained in the study in the same manner as the control group.

Another item with which we were concerned was the ability of the individual to recall accidents. While the interviewer asked about all accidents that had occurred to the family within the past month, accidents were coded separately according to those which had occurred within a week prior to the interview and those which had occurred in the remainder of the month. Of the total accidents reported, 46.6 percent were reported as occurring within a week prior to the interview, 50.2 percent within the rest of the month, and 3.2 percent were reported as date unknown. Logically, one would expect three times as many accidents to be reported in the first 3 weeks of the interview month as in the week prior to the actual interview. However, the tabulation of accidents reported within 1 week prior to the date of interview, does show a distribution similar to that found for all accidents (table 1).

### Accident Morbidity Data

In testing the hypothesis that accidental poisoning may be associated with a higher than average incidence of accidents, the study uncovered accident morbidity data which are similar to the findings of other accident studies. The distribution of accidents by age group is given in table 5. The distribution of home accidents shows a pronounced age-specific rate differential. The higher accident rates are associated with the younger age groups (table 5). While the home accident rates for both poison and control groups were nearly identical for most ages, in the poison group slightly higher

rates were noted for age groups 1-2 years and 3-4 years.

Figures are available showing the location of greatest accident liability in the home. Excluding the original poisoning, for males in both poison and control groups the largest number of accidents occurred in the yard, with 22.2 percent of accidents in the poison group and 18.0 percent of those in the control group occurring there. For females in both groups, the kitchen was the most dangerous place; 22.3 percent of accidents in the poison group and 23.7 percent of those in the control group occurred in the kitchen.

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nine cases in the poison group and the six cases in the control group actually represent an identical rate. While the assumptions stated above may be questioned, if they were true, the "repetition" of accidental poisoning observed would be exactly what we would expect on the basis of chance alone.

### Discussion

Data gathered by this study about the nature of accidents were somewhat limited since the study included only families with a child under 5 years of age. The study was designed with the intent of providing a test of the possibility of using the fact of poisoning as a technique for finding families with a high incidence of accidents.

Results do not seem to favor using accidental poisoning as an indication that a family is subject to a high incidence of accidents of all kinds. We gathered no systematic evidence to indicate that a poisoning accident made the family more aware of safety and more receptive to information on safety. Furthermore, we did not get information as to the level of potential hazard of various toxic materials, nor as to their storage.

### Genesis of an Accident

In the July issue of *Public Health Reports*, Dr. Albert L. Chapman, Assistant Surgeon General, Public Health Service, discussing "The Anatomy of an Accident," described how a series of unsafe acts led to an injury caused by a flower pot falling from a window. While his text was in the hands of the printer, an accident remarkably similar to the hypothetical accident outlined by Dr. Chapman was reported by the Associated Press, as shown here in a clipping from the *Washington Post*. The tragic event gave substance to Dr. Chapman's conviction that unsafe acts in themselves are the important target in accident prevention campaigns.

### Summary

The San Jose (Calif.) City Health Department tested the feasibility of using the occurrence of a case of accidental poisoning treated at an emergency facility as an indicator of a family with a high incidence of accidents. However, such families experienced no more accidents than the average of similar families, except for a slightly higher rate for home accidents in the poison group for ages 1-2 years and 3-4 years.

The accident experiences of 118 poison group families and 80 control group families were obtained by means of periodic household interviews. Poison group families were chosen on the basis of having a child under 5 years of age who had been treated for poisoning at the San Jose Emergency First Aid Station. Control families were made up of a systematic sample of all families in San Jose who had one child under 5 years of age. Comparison of the accident rates for the poison and control groups revealed no major differences. Accidental poisoning cases treated at an emergency facility do not seem to be a means of casefinding for families with a high incidence of accidents.

### Any Negligence Ruled Out in Dumbbell Death

NEW YORK, July 7 (AP)—The District Attorney's office today ruled out any criminal negligence in the death of Detroit businessman Alvin Rodecker, struck on the head by a dumbbell two weeks ago.

The dumbbell was being used to prop a screen in the eighth-floor apartment of television entertainer Arlene Francis and her husband, theatrical producer Martin Gabel, at the Ritz Towers.

It was accidentally dislodged by a maid and struck Rodecker as he strolled with his wife at Park ave. and 57th st. He died the next day, June 24.

# An Approach to Metropolitanism

MALCOLM C. HOPE, Ch.E., M.P.H., and B. COWLES MALLORY, B.S., M.G.A.

UNIQUE and staggering problems confront the public health engineer looking at a modern metropolis. Some stem from rapid population growth, others from the maze of local governments. They are unique because the engineer has the technical knowledge necessary to solve them but not the means of applying his ability. They are staggering by the sheer force of the number of people affected.

The large metropolitan areas are a fact of life today that is not likely to be wished away. Every indication points to the continued concentration of people, production, and services in and around the large cities. The large "metros" will grow even larger until, for example, there may be one continuous built-up area extending from Portland, Maine, to Richmond, Va., and another stretching across the entire industrial belt of the Midwest. Even today a traveler sees few open areas in these regions.

Everyone has his own method of showing this growth. The fact that, in this decade, 85 percent of the country's population growth has taken place in the "metros" with the suburbs growing six times as fast as the central city, is the point we emphasize.

To fully appreciate the health officials' dilemma, it is necessary to understand the setting. Housing developments cut across borderlines of traditional governments and flow out into unincorporated areas to produce a governmental maze that almost defies description, let alone solution. In 1957, an average of 90 local gov-

ernmental units existed in each "metro." Since 1952, 170 new municipalities and 519 new special district governments have been created within the 174 largest "metros."

No universal governmental pattern applicable to all areas has been developed and none appears likely. Curiously enough this is the only point on which there seems to be universal agreement among political, governmental, and administrative specialists. There seems to be no characteristic difference in organization or situation between the successful and unsuccessful. Special districts are often endorsed by groups interested in only one governmental function. Political scientists, however, criticize them as creating another level of local government, a pattern already complex with the relationship of citizens to government uncertain and often irritating. Annexation, incorporation, federalization, functional transfer, all have been tried. All have had successes and failures. A study by the Government Affairs Foundation indicates that each metropolitan area faces similar problems, but a wide variety of solutions are suggested.

Where does this leave the sanitary engineer? What does he face while the politicians battle over forms of government? In one case, he must deal with a 5-year old subdivision of \$30,000 homes where 60 percent of the septic tanks are failing. In another area, he is faced with a citizenry that will fight a proposed sewer system in order to maintain local autonomy. Air pollution may refuse to hover over the community that produces it. He may supervise a water system that will be inadequate next year or a subdivision with individual wells and septic tanks on small lots. Or present landfill capacity is being depleted while homes are being built over possible future disposal sites. The

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problems and more like them are familiar to any local environmental health official.

What can the health officials do? Is the problem too complex to solve? The solution is not yet known but we have a good approach through community planning. Planning is a well-established process, seeking to promote a better environment. By working with planners, health officials can make substantial progress.

There are no "pat" answers to urban sprawl. There are, however, certain steps which tend to help. These follow the standard pattern of scientific approach, find the facts, evaluate the facts, determine needs, and seek solutions. They help by virtue of promoting orderly community growth. It cannot be said that they will insure satisfactory results, but there is a great deal of evidence that without them there is much less chance of success. Working to promote this procedure by development of comprehensive sound plans for community action appears to be the most promising approach.

But the use of this process by local officials is not as easy as it sounds. It has been demonstrated repeatedly that health officials know more than they are able to apply. The solution to environmental health lies in a context of sociological and political factors. As always in the political scene, human motivation, politics, governmental structures, group dynamics, and leadership play dominant roles. The most carefully engineered and logical solutions often fail when subjected to the political process.

The philosophy that must be used is the essence of the planning process, the collection and analysis of facts and the projection of these facts into the future. Progress is made by having the health facts available as guides for shaping legislative decisions. Even a good plan often fails, but a poor plan or no plan at all isn't even a good try.

The best technique to accomplish this progress is well known to city planners. It is, simply, the development of comprehensive, sound plans for use in guiding community action. Such plans will seldom be carried out without changes and even reverses, but given enough support and considered as a goal, they very likely will be approached ultimately. The at-

tainment of sharply defined objectives, even though modified during the process of achievement, promise greater chance of success than the chaos and confusion inherent in promoting ill-defined, nebulous goals. To one accustomed to expecting clear-cut decisions and actions, this interplay of human failure to accept a professionally sound plan is discouraging. Yet, it is a fact, and one which must be recognized.

## Health and Planning

Environmental health is strategic to the work of a city planner for one basic reason, the need to make the community a healthy (healthful) place in which to raise a family and make a living. Health precedes all other needs, such as transportation, schools, and industrial activity. And a public health official should remember his importance in planning a community's growth.

In actual fact, health reasons have had a limited although very beneficial effect on community planning. In studies of 11 "metros" conducted by the General Engineering Branch of the Public Health Service, outstanding environmental health programs were observed, and community planning was an impressive factor in achieving these positive results. Seven of the 11 counties studied had either local or county planning agencies. The cooperation between them and the health departments ranged from nonexistence to a day-to-day working relationship between professional staffs. A definite relationship was observed between the degree of cooperation of health and planning officials and the level of environmental health services. Four counties with superior cooperation had, in general, better health services than three where little cooperation was found. Personal participation by the health official in planning was essential to their effective development and application.

It is more significant that counties giving consideration to environmental health factors in planning were in a superior position in overcoming or preventing future problems. The four counties making no plans were in no position to cope satisfactorily with the health aspects of population growth.

The 1958 National Health Forum had as its

## Discussion

I heartily endorse close working relations between health agencies and professional planning groups at the city, the metropolitan, the State, and the regional areas.

However, further consideration should be given to using the drainage area as a basis for managing water supply and waste disposal. The gravitational flow of water never respects political boundaries. Moreover, the direction of flow cannot be altered with as little expense as a political boundary.

In the introduction, the authors led the reader into a concept of large "metros" of a corridor character cutting across wide geographic areas. But in the body of the paper, the actual practical relations with planners imply a city of more or less narrow metropolitan approach.

More consideration to State or regional planning might make it possible to develop a drainage basin system through close working relations with water resource commissions and conservation departments.

The authors have not only stimulated thought but have indicated avenues of approach. It is indeed encouraging to see the health agencies take the initiative in working at all levels of community planning. It is only through such effort that we shall provide modern urban technological society with an environment in which people can thrive and not merely survive.—C. J. VELZ, *chairman, department of environmental health, the University of Michigan School of Public Health, Ann Arbor.*

theme "Urban Sprawl and Health." Its purpose as stated in the preface to the final report on the conference was to "emphasize the need for, and demonstrate a pattern of, understanding and cooperation between planning and health toward the goal of healthier people in healthier cities, suburbs, and related areas."

### Community Planning

What exactly is this community planning we are promoting? It is not a mysterious process understood only by experts, nor a substitute for the democratic process. It is not detailed design: it is simply a guide for future com-

munity development. All the factors affecting growth and community aspirations are considered. These facts are collected, analyzed, and used as a guide for making legislative decisions that in turn shape the future environment. Planning is less a policymaking function than a professional task. A local council pays good money for professional advice. Although the council may not follow their suggestions, the planners' influence is usually felt. Even if a plan is not fully adopted, the planning process is important in both molding and influencing community thought. And often the mere existence of a planning body causes the community to think more seriously about its future.

Usually, the local legislative body is responsible for appointing a planning board or commission. Very often such a planning board is completely independent of the executive branch of the local government, but in some places the board is a part of a department within the executive branch. There is little evidence to indicate that any one form of administrative arrangement is better than another. In a larger community, usually the board employs its own staff; in smaller cities, it often relies on a private consultant. Most staffs or consultants are highly technical people, while boards or commissions are composed of laymen.

The planners use four major tools to guide the growth of a community: master plans, capital budget, zoning, and subdivision regulations. In the fields of master planning, zoning, and capital budgeting, the planners act only as advisers to the council, with some communities requiring the council to refer certain matters to the planners for recommendations. Very rarely is the council required, however, to follow their advice. But in subdivision regulations, the planning board or commission may have limited legislative power. For example, in a typical case an extraordinary majority of the council would be required to override the planning board's recommendations, but only a simple majority could endorse them.

*Master plan.* The most important planning tool in setting forth all the facts influencing the community's development and serving as a guide for future growth is the so-called master plan. Presented on a map of future

land use, this master plan encompasses the total problem; transportation, communications, schools, recreation, utilities, appearance, industry, economic base, sewers, water, residential and commercial areas, and many other considerations are all a part. In addition, it attempts to find the interrelationships among all these. In most cases, the plan has no legal status, since it is rarely enacted into law. Frequently the local council votes an informal approval, however.

Health should be considered carefully in developing a master plan. The consideration given to the importance of health needs in the planning stage may determine the actions of the local legislative body when it weighs needs of the whole community in the future environment.

*Capital budget.* A capital budget is developed from an analysis of the community's financial resources and prospects. A priority schedule of site acquisitions and expenditures for large-scale physical improvements, such as buildings, streets, and utilities, is presented as the counterpart or complement of the master plan. Such a capital budget is not enacted as an ordinance or law by the council but is used as a guide in preparing the annual budget to apportion the financial burden over a period of several years.

Sewage treatment plants, landfill sites, and similar environmental health facilities must compete for funds with other community requirements. A capital budget is an excellent way to get a higher priority for health facilities if health officials make the facts known to the planners. The facts are usually convincing. The dividends from the majority of investments in environmental health are much greater than an equal investment in other facilities.

A good capital budget, like a good master plan, is characterized by its projection into the future, its flexibility, and the interrelationship of its parts; it is subject to continual study and revision.

*Zoning:* The third major tool of planners is zoning. Facts prepared by the planners for an immediate single legislative decision are often given in detail for council consideration. A zoning map will be included, together with the regulations for various zones.

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## Advances for Public Works Planning

The Community Facilities Administration of the Housing and Home Finance Agency reports that since the beginning of its program of advances for public works planning through March 31, 1960, 2,341 applications totaling requests for \$74.9 million have been received. The agency approved 1,346 for \$31.3 million. Of the applications received, 53 percent have been for sewer and water projects, about 2 percent for hospitals and other health facilities, and the remaining 45 percent for educational facilities, public buildings, streets, bridges, and other miscellaneous public facilities.

The program of advances for public works planning was established by the Housing Act of 1954 and its amendments in 1955. Under this legislation, funds may be advanced to States, municipalities, and other public agencies to help finance the cost of the planning of needed public works. These advances are repaid, without interest, when construction is started or when contracts are awarded.

The purpose of the program is to encourage municipalities and other public agencies to maintain at all times a current and adequate reserve of planned public works which can readily be placed under construction, and help attain maximum economy and efficiency in the planning and construction of public works.

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Zoning utilizes the police power of the local government to regulate land use, and, therefore, is actually enacted into law by the council. Among other things, a zoning ordinance delineates residential, commercial, and industrial zones; establishes lot sizes; regulates building height and setback; and establishes performance standards. These requirements govern the population density which in turn affects sewer sizing, the quantity of solid wastes, and the water consumption of an area.

A good zoning ordinance is an extension of the master plan, but need not necessarily follow it in every respect. Zoning has certain short-term aspects relative to land use, while the master plan is a long-term land use projection.

*Subdivision regulations.* Subdivision regulations are the laws governing the division of

land parcels for sale as separate lots. In contrast to zoning which is based on the police power, subdivision regulations are enforced by the power to withhold the privilege of public record. If a plot is not recorded, it can be sold only by metes and bounds, that is the length and bearing of the boundary lines. It is difficult to sell land in this manner because of the lack of adequate control to enforce the regulations. Often a community will make it even more difficult to use metes and bounds by making it illegal to refer to an unrecorded plot. It is much easier to sell land by block and lot numbers. In return for this privilege of public record, the community requires conformance with certain standards. These standards may cover the layout, grading and surfacing of streets, length of blocks, area and location of open water supply, connection to public sewers, storm drainage, or conformity to adjacent plots.

Subdivision regulations can be used to control the installation of on-lot sewage disposal systems and on-lot water supplies. These are health factors which can be taken into consideration if a health department reviews the plots before they are recorded. To be most effective, the law should require that health department approval of such on-lot installations be mandatory rather than simply advisory.

### Health Department Action

Master plans, capital budgets, zoning, and subdivision regulations, the four tools of planning, are the main phases of the community planning process, and each has a direct effect on environmental health. The question then arises, how can the health official become a part of this planning process? Since community planning is principally the work of professionals, the best method is to work with the planners.

A planner, like a health official, is a specialist. His motivation, or dedication if you will, is much the same as that of environmental health officials. He wants a comfortable income, but his rewards are found just as much in accomplishments from his work as from monetary return. Like the health official, he is working for a better environment.

Observations in the 11-county survey revealed that an effective health official made it a point to get to know the local professional planners in his community, to learn what they do, how they think, and what they are trying to accomplish. He took pains to find out how much influence the planners have and whom they influence. It surprised many an "old hand" in the community to find out how effective planners could be.

To ascertain what the planners were doing, the health officer studied the planners' maps and charts and read their publications. He attended their board meetings to see what things are considered and how much they have to do with health. Conversely, he let the planners know what environmental health officials do, the problems they face, and the goals they seek.

A great deal of benefit came from exploring common problems and approaches. Both the health official and the planner were working toward the same ends and against the same obstructions. Each realized that he could and should help the other. The planner needed the facts that only the health official could supply.

The most important factor observed was the value of maintaining a close working relationship between the professional personnel of the two disciplines. The small day-to-day contacts and exchanges of information produce big results in the long run.

In essence an effective health official convinces the planners that public health engineers are not just technicians but are full-fledged professionals with the vision and imagination to see into the future.

### Summary

Over the years, health activities have progressed from a concern with disease alone to a broader concern with health and now are expanding to include planning for future health services as well. Although little used at present, community planning has been a very useful tool for the environmental health official in carrying out this expanded concept of public health. Tomorrow's environmental health problems can often be prevented by health department participation in the community planning process today.



# Federal Publications

**Treating Cancer.** *PHS Publication No. 690; 1960; 16 pages; 15 cents.*

Modern uses of medically approved treatments in saving a growing proportion of cancer patients are described in terms understandable to the layman.

The purposes of cancer surgery and the improvements and research in this field are discussed. A section on radiation defines X-ray and radioisotopes and tells how radiation is used to treat cancer. Hormones, cell poisons, metabolic antagonists, and antibiotics are covered in the section on chemotherapy.

Seven books and pamphlets and 14 articles are listed in the recommended reading.

**Dietary Aspects of Cardiovascular Diseases. Selected references.** *PHS Publication No. 755; 1960; 24 pages.*

Designed for public and voluntary health workers, this annotated list of research papers, pamphlets, books, and teaching aids covers the dietary aspects of cardiovascular diseases.

The material is organized into five major areas: general information; calorie restriction—obesity and weight control; sodium restriction—congestive heart failure and hypertension; fat control—atherosclerosis and coronary artery disease; and food composition tables.

A flip chart format (8½ inches by 11 inches) is used to separate and identify each of the major categories.

**Directory of Local Health Units.** *PHS Publication No. 118; revised 1960; 80 pages; 30 cents.*

Local health units of each State are listed alphabetically according to classification of the unit. Included are the name of the health officer or administrative head and the city in which the headquarters is located.

The appendix contains tables showing the number of units and counties covered; the number of units without medical, nursing, or

sanitation personnel; and the units with a vacancy in the position of health officer or administrative head.

**Health Statistics From the U.S. National Health Survey. Types of injuries, incidence, and associated disability, United States, July 1958–June 1959.** *PHS Publication No. 584-B16; 1960; 36 pages; 30 cents.*

Estimates of the number of injuries and days of disability, by class of accident, sex and age of the victim, and type of injury are presented. Injuries are classified as fractures and dislocations, sprains and strains, head injuries, lacerations and abrasions, contusions, burns, poisonings, effects of weather and exposure, and complications of therapeutic procedures.

Included are 15 detailed tables, a population table, the questionnaire on which the statistics were collected, and appendixes containing definitions and technical notes on methods.

**Health Statistics From the U.S. National Health Survey. Peptic ulcers reported in interviews, United States, July 1957–June 1959.** *PHS Publication No. 584-B17; 1960; 26 pages; 25 cents.*

Detailed tables, text tables, and charts give estimates on prevalence of peptic ulcers, according to medical attention status and by age and sex of the patient.

Associated disability is shown by days of restricted activity, days of confinement to bed, and days lost from work.

Appendixes contain technical notes on methods, definitions, and the questionnaire on which the data were collected.

**Health Statistics From the U.S. National Health Survey. The Hawaii health survey, description and selected results, Oahu, Hawaii, October 1958–September 1959.** *PHS Publication No. 584-C3; 1960; 54 pages; 40 cents.*

The design, content, and preliminary findings of the health interview

survey conducted cooperatively by the Hawaii State Department of Health, the Oahu Health Council, and the National Health Survey are presented.

Twenty tables and numerous charts show selected survey results. Appendixes contain notes on sampling errors, definitions, a list of the contributors to the project, and a reproduction of the questionnaire on which the data were collected.

**Strike Back at Arthritis.** *PHS Publication No. 747; 1960; 45 pages; 40 cents.*

Therapeutic procedures that can be carried out in the home by the patient and his family are described.

Designed to aid physicians in prescribing treatment for arthritis patients and instructing them in proper care, the manual gives step-by-step instructions for 15 exercises which will preserve or improve the range of motion of the involved joints. Each exercise appears in duplicate on facing pages. The page labeled "ACTIVE" shows how the patient can do the exercise by himself. The page labeled "ASSISTED" shows how someone can help the patient do the same exercise.

Other sections deal with the importance of good posture, the use of heat, splinting, canes and crutches, and self-help devices.

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*This section carries announcements of new publications prepared by the Public Health Service and of selected publications prepared with Federal support.*

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The Public Health Service does not supply publications other than its own.

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# Malaria Control and Population Pressure in Ceylon

HARALD FREDERIKSEN, M.D., M.P.H., D.T.M.&H.

THE HISTORY of Ceylon is frequently cited as an example of the demographic effects of malaria control. A reduction in the death rate (for all causes of death) from 20.3 in 1946 to 14.3 in 1947 has been attributed to malaria control through the residual spraying of insecticides (1-8). The reduction in the death rate with a relatively constant birth rate has led to the widely publicized conclusion that malaria control had caused a "population explosion" (4-11), which in turn has led to predictions of impoverishment and famine in Ceylon as ultimate results of malaria control (6, 10).

The conclusion that malaria control was primarily responsible for the reduction in the death rate of Ceylon in 1947 arose from the coincidence of the drop in the death rate with the extension of residual spraying of insecticides. This conclusion implied that the control, as well as the problem of malaria, affected a major proportion of the population. However, surveys conducted prior to the campaign indicate that 62 percent of the population of Ceylon resided in essentially nonmalarious districts, whereas residual spraying was confined to the area with endemic malaria (table 1).

The first year that a substantial proportion of the population exposed to malaria was protected for a full year was 1947. Those protected in that year represented 28 percent of the population of Ceylon. But the semiannual death rates of Ceylon indicate that the most dramatic reduction in the death rate (all

causes) had already taken place in the second half of 1946, when only 18 percent of the national population had been protected from malaria. The protection of 18 percent of the population of Ceylon does not seem to explain the 25 percent reduction in the death rate of all Ceylon from 21.3 in the second semester of 1945 to 15.4 in the second semester of 1946 (table 2).

The pronounced decline in the death rate in the second semester of 1946 invited a comparison of the mortality experience in the malarious and nonmalarious areas of Ceylon at that time. The number of deaths (all causes) in the second semester of 1946, when compared with the number of deaths in the second semester of 1945, declined 24 percent in the unprotected nonmalarious area and 26 percent in the malarious area, or 25 percent overall. The difference between the 25 percent decline in mortality for all Ceylon and the 24 percent decline in mortality in the unprotected nonmalarious area of Ceylon is insufficient to establish malaria control as the significant factor for the dramatic decline in mortality for Ceylon during the second semester of 1946 (tables 3 and 4). Further comparisons of the mortality experience in the malarious and nonmalarious areas fail to provide evidence that malaria control had been the sole or major factor in the postwar decline in mortality in Ceylon (tables 3 and 4).

The death rate (all causes) of Ceylon had been displaying a downward trend at least since 1905. The downtrend was interrupted during the latter part of the Second World War and in 1935, when a disastrous drought was associated with a sharp rise in mortality, attributed

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**Table 1. Population, area, and population density of districts of Ceylon grouped by the endemicity of malaria in the districts**

Endemicity of malaria	Spleen rates <sup>1</sup> (percent)	Population <sup>2</sup>		Area		Population density per square mile
		Number	Percent	Square miles	Percent	
Not endemic.....	0-9	4, 142, 889	62	5, 113	20	810
Moderately endemic.....	10-24	1, 207, 569	18	5, 271	21	229
Highly endemic.....	25-49	994, 495	15	8, 460	33	118
Hyperendemic.....	50-74	312, 466	5	6, 489	26	48

<sup>1</sup> Average of surveys in 1939 and 1941.

<sup>2</sup> 1946 census.

SOURCES: Ceylon Department of Census and Statistics, *Census of Ceylon, 1946*, and reports of the Government of Ceylon submitted to the World Health Organization Malaria Conferences at Bangkok, September 1953, and Taipei, November 1954.

to malaria acting singly or in combination with dysentery and famine. Following are the annual death rates (all causes), based on the estimated population in the respective years, for Ceylon from 1905 through 1953.

Years	Death rates	Years	Death rates
1905-1914.....	31.0	1943.....	21.4
1915-1924.....	29.1	1944.....	21.3
1925-1934.....	23.6	1945.....	22.0
1934.....	22.9	1946.....	20.3
1935.....	36.6	1947.....	14.3
1936.....	21.8	1948.....	13.2
1937.....	21.7	1949.....	12.6
1938.....	21.0	1950.....	12.6
1939.....	21.8	1951.....	12.9
1940.....	20.6	1952.....	12.0
1941.....	18.8	1953.....	10.9
1942.....	18.6		

SOURCE: Reports of the Registrar General on Vital Statistics, Ceylon.

Comparison of population density and malaria endemicity reveals a reciprocal distribution of population and malaria in Ceylon. The population density of the nonmalarious area was 17 times that of the area with hyperendemic malaria (table 1). The ancient civilization of Ceylon had centered in the area with hyperendemic malaria. The ruins of 10,000 dams testify to the level and magnitude of this civilization in successive stages of history. Decay of the ancient order was associated with collapse of the irrigation systems, emergence of conditions that favored transmission of malaria, and retreat of the Singhalese to the nonmalarious area of the island.

Elimination of endemic malaria, which had become a barrier to resettlement and development of the major part of Ceylon, may serve to reduce the population pressure in the congested area by removing the disease which had restricted the majority of the population to one-fifth of the island territory (table 1). Malaria control will permit full use of the resources in the area which is relatively underpopulated and underdeveloped (see chart).

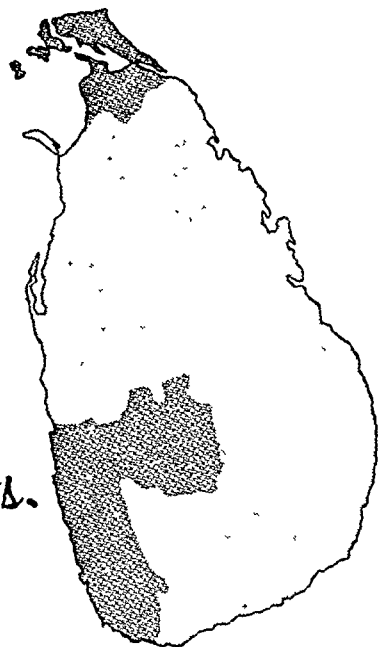
**Table 2. Percentage of population protected against malaria by residual spraying of insecticides and semestral death rates (all causes). Ceylon, 1944-53**

Year	Semiannual death rates <sup>1</sup>		Percent of population protected
	First semester	Second semester	
1944.....	21.6	21.1	0
1945.....	22.6	21.3	3
1946.....	25.1	15.4	18
1947.....	15.2	13.2	28
1948.....	13.5	13.2	40
1949.....	13.0	12.1	36
1950.....	12.3	12.9	35
1951.....	13.1	12.7	36
1952.....	12.3	11.7	38
1953.....	10.8	11.1	36

<sup>1</sup> Based on estimated population in the respective years.

SOURCES: Reports of the Registrar General on Vital Statistics, Ceylon, and reports of the Government of Ceylon submitted to the World Health Organization Malaria Conferences at Bangkok, September 1953, and Taipei, November 1954.

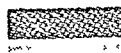
Prior to the malaria control campaign,  
62 percent of the population of Ceylon  
lived in essentially nonmalarious districts.



POPULATION DENSITY  
per square mile

810

124



SPLEEN RATES  
percent

0-9

10-74

"Although Ceylon is a small country which is primarily agricultural, nearly two-thirds of the Island has been uncultivable chiefly owing to the dreaded disease, malaria. With the removal of malaria today, a serious menace to the country, it will be possible to open up these vast tracts of land considerably to improve the living conditions of the people, the majority of

whom hitherto have been living in poverty and misery" (12).

This analysis of mortality in Ceylon should quiet unfounded fears that malaria control in-

**Table 3. Deaths (all causes) in the malarious and nonmalarious areas of Ceylon during the second semesters, 1944-48 and 1953**

Second semester	Malarious area <sup>1</sup>	Non-malarious area <sup>2</sup>	Ceylon
1944.....	26,346	39,842	66,188
1945.....	29,932	39,466	69,398
1946.....	22,186	30,058	52,244
1947.....	18,389	28,310	46,699
1948.....	17,126	29,175	46,301
1953.....	17,511	27,667	45,178

<sup>1</sup> Districts with spleen rates from 10 to 74 percent (surveys of 1939 and 1941).

<sup>2</sup> Districts with spleen rates from 0 to 9 percent (surveys of 1939 and 1941).

SOURCES: Same as for table 2.

**Table 4. Death rates (all causes) in the malarious and nonmalarious areas of Ceylon during the second semesters, 1944-48 and 1953**

Second semester	Malarious area <sup>1</sup>	Non-malarious area <sup>2</sup>	Ceylon
1944 <sup>3</sup> .....	21.0	19.2	19.9
1945 <sup>3</sup> .....	23.8	19.1	20.8
1946 <sup>3</sup> .....	17.6	14.5	15.7
1947 <sup>3</sup> .....	14.6	13.7	14.0
1948 <sup>3</sup> .....	13.6	14.1	13.9
1953 <sup>4</sup> .....	10.9	11.3	11.2

<sup>1</sup> Districts with spleen rates from 10 to 74 percent (surveys of 1939 and 1941).

<sup>2</sup> Districts with spleen rates from 0 to 9 percent (surveys of 1939 and 1941).

<sup>3</sup> Based on census population of 1946.

<sup>4</sup> Based on census population of 1953.

SOURCES: Ceylon Department of Census and Statistics, Census of Ceylon, 1946 and 1953, and Reports of the Government of Ceylon submitted to the World Health Organization Malaria Conferences at Bangkok, September 1953, and Taipei, November 1954.

vites famine. The available evidence fails to establish malaria control as the sole or major cause of a population explosion in Ceylon. At the same time, malaria control has made habitable what was in ancient times the most populous and productive area of the island. It appears that in Ceylon the net demographic effect of malaria control for the present could be to reduce population pressure by providing more living space.

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## New Diagnostic Test for Lupus Erythematosus

A simple diagnostic test which allows accurate screening of large numbers of patients for disseminated lupus erythematosus in a short time has been developed by public health scientists at the National Institutes of Health, Public Health Service.

A connective tissue disease related to rheumatoid arthritis, lupus erythematosus is far more common than indicated by past statistics. Manifestations may include blood, kidney, or nerve disorders, mental disease, arthritis, and butterfly rash of the face and may appear simultaneously. There may be no serious complications for years, but in its acute, disseminated form, it is frequently fatal.

The test, similar to that devised earlier for rheumatoid arthritis, consists of adding a drop of the patient's serum to bentonite sensitized by desoxyribonucleic acid. If the disease is present, flocculation occurs after about 15 minutes of agitation.

Clinical results are described by John

Bozicevich, who heads the Basic Immunology Section, Laboratory of Immunology, and Dr. John P. Nasou and Dr. Donald E. Kayhoe of the Laboratory of Clinical Investigations in the National Institute of Allergy and Infectious Diseases, Public Health Service, reporting in the *Proceedings of the Society for Experimental Biology and Medicine*, March 1960.

Advantages of the test are the elimination of the need for fresh whole blood, required by the cell test, and its high specificity. Six persons with frank rheumatoid arthritis gave positive reactions for lupus with the former test, but all were found negative with the flocculation test. Tests on eight lupus patients were conducted with complete agreement in results with the older procedure. For controls, 138 serum specimens from normal individuals or from patients with related and unrelated diseases were appraised, with negative reactions.

More details of the test appear in the *New England Journal of Medicine* for July 7, 1960.

*By Leroy E. Burney, Surgeon General.  
Public Health Service, August 24, 1960*

# Oral Poliovirus Vaccine

During recent months, a number of conferences have been held at which progress in the field of immunization with live poliovirus vaccines was reported. These conferences include the meeting held in Moscow in May, the joint Pan American Health Organization-World Health Organization Conference held in Washington in June, and the 5th International Congress on Poliomyelitis held in Copenhagen in late July. The staff of the Public Health Service and its Advisory Committee on Live Poliovirus Vaccine has given careful consideration to the information available from these meetings—indeed, some members have actively participated in these meetings.

It may be recalled that about a year ago recommendations relating to the manufacture and testing of live poliovirus vaccines were issued to facilitate the entry of interested manufacturers into this complex field. Last week, the committee met with the manufacturers and other interested persons in order to review these recommendations.

Revisions to these earlier recommendations, which will serve as the basis for adoption of regulations for manufacture and testing of the vaccine, have been agreed to by the committee. These include the virus strains to be used, the general processes of manufacture to be followed, tests to be applied during manufacture, and factors relating to the continued safety, purity, and potency of the vaccine.

The Service's Division of Biologics Standards is moving with all speed to complete technical details of the final regulations while the manufacturers proceed with preliminary steps toward meeting these requirements. These details will be available in the near future.

In addition, I have received a general short report from the committee. On the basis of these recommendations, it is considered that live poliovirus vaccine is suitable for use in the United States. It is now possible to visualize the licensing of the establishments for manufacture and sale of these products when manufacturers have individually demonstrated the necessary experience and ability to produce material which conforms with the requirements.

It is not anticipated that the vaccine will be available in any quantity for a number of months, and it is doubtful whether substantial supplies will be available before mid-1961. In any case, I consider it important to note the committee's recommendation for the integrated use of the live poliovirus vaccine with the presently available vaccine and for the rather special requirements concerning use of live poliovirus vaccine in the American population. I shall take up certain of the problems raised by the committee regarding the optimal use of live poliovirus vaccine in the United States with appropriate advisory groups, such as the State and Territorial health officers and representatives of the medical and health professions and of the voluntary health agencies.

## COMMITTEE RECOMMENDATIONS

The Public Health Service Committee on Live Poliovirus Vaccine considers that field studies of oral poliovirus vaccines have advanced our knowledge to a stage where recom-

mendations relating to its manufacture can now be written.

The committee also has considered the need for careful analysis of the problems associated

with adapting such vaccines to immunization programs in this country and made recommendations thereon.

### Vaccine Characteristics and Strain Selection

In line with its efforts to further the progress of immunization against poliomyelitis, the committee met on August 19, 1960, with technical representatives of potential manufacturers, with other interested persons, and with the staff of the Division of Biologics Standards, National Institutes of Health, for the purpose of reviewing the proposed requirements for the manufacture and testing of live poliovirus vaccine. The amended requirements which outline the manufacturing and testing objectives will become available shortly from the Division of Biologics Standards and should be helpful in assisting those manufacturers who wish to enter into production. It is hoped that manufacturers can proceed without delay to develop the necessary experience for the mass production of live oral poliovirus vaccine.

The committee feels that three factors when considered together make possible its recommendation regarding strain selection. These factors are: (a) Neurovirulence in monkeys, (b) viremia in man, and (c) field experience with all candidate strains. The committee again emphasizes the need for definitive information on the question of viremia in man.

The committee considers that of the strains available for preparing live oral poliovirus vaccine the Sabin type 1 and type 2 strains possess the most favorable laboratory and field characteristics and recommends their use. The committee also recommends the use of the Sabin type 3 strain which is satisfactory from the point of view of neurovirulence although it has less than optimum immunogenic capacity and shows a tendency to change its neurovirulence characteristics after passage in man. The committee urges the continued search for a superior type 3 strain. All candidate strains other than those of Sabin which have been studied extensively are of greater neurovirulence for monkeys than the selected reference.

The committee expresses the view that neurovirulence for monkeys is the most important laboratory criterion available. This criterion

was used for selecting candidate strains and is still the only measurable laboratory property which can be assumed to be correlated with neurovirulence in man. On the basis of the information available, the committee recommends that the intrathalamic test in monkeys be adopted as the criterion for neurovirulence and that in order to be suitable for vaccine manufacture strains should exhibit little or no evidence of neurovirulence when inoculated in this manner into monkeys. The committee considers that any strain which shows neurovirulence for monkeys by causing paralysis when administered by the intramuscular route is unsuitable. The committee recommends that the intraspinal test be retained mainly as a measure of the susceptibility of the monkeys used. It recommends that the Sabin type 1 strain be used as a reference in the conduct of these tests.

The committee took cognizance of the great contributions of Dr. Herald Cox and of Dr. Hilary Koprowski, who with their colleagues promulgated the concept of live oral poliomyelitis vaccine and, using their own attenuated strains, provided much of the crucial information which advanced the development of this new vaccine.

The committee concludes that the field data now available indicate that while good levels of immunity can be obtained under certain conditions such levels can only be assured by repeated doses. Schedules of administration will depend upon local conditions since capacity "to take" or "immunogenic effectiveness" of these vaccines is influenced by a number of factors, the most important of which is the prevalence of other enteroviruses in the community being immunized. The committee does not believe that the capacity to immunize of any strain is such that the neurovirulence requirements should be compromised.

### Need for Planned Use of Oral Vaccine

In view of the fact that the nationwide programs with killed virus vaccine failed to achieve the hoped-for elimination of all epidemics of paralytic poliomyelitis, the committee emphasizes the need for critical assessment of the place of live poliovirus vaccines in the overall picture of poliomyelitis prevention in the

United States. The uncoordinated use of live poliovirus vaccine is unlikely to accomplish more than has been achieved with inactivated poliomyelitis vaccine as presently employed. It appears probable that only a unified national program which utilizes each of the available types of vaccine to its best advantage can accomplish the total prevention of outbreaks.

The committee must also emphasize that when live poliovirus vaccine becomes available generally in this country, its use will be more appropriate on a community than on an individual basis. This will depend upon a number of factors, and special recommendations will be necessary for the guidance of physicians, public health officials, and others who will be engaged in such programs. Attention should be given to such matters as administration to special groups; for example, very young children, pregnant women, susceptible adults, and others, and even more important is the planned continuation of this program as long as necessary to achieve and maintain the required results.

The committee supports the view that the Public Health Service has a function to perform, extending beyond its regulatory responsibilities, to the end that a satisfactory live

poliovirus vaccine may not only be made available at an early date, but may be properly integrated into the total pattern of infectious disease prevention in the United States.

Because of the unique nature of live poliovirus vaccine, with its capacity to spread the virus in a limited manner to nonvaccinated persons, the committee cannot make recommendations for manufacture without expressing concern about the manner in which it may be used. The seriousness of this responsibility can be illustrated, for example, by the known potentiality of reversion to virulence of live poliovirus vaccine strains, and the possible importance of this feature in the community if the vaccine is improperly used.

For example, the vaccine has been employed largely in mass administrations where most of the susceptibles were simultaneously given the vaccine, thus permitting little opportunity for serial human transmission; or, it has been administered during a season of the year when wild strains have usually shown limited capacity for spread. This experience should provide the basis for developing usable practices for the United States.—*Respectfully submitted by the Committee on Live Poliovirus Vaccine, Robert Murray, M.D., chairman.*

## Education Notes

*Department of Radiological Science.* The Johns Hopkins University School of Hygiene and Public Health is establishing a new department of radiological science which will be concerned with all aspects of the radiation health picture. The department will train radiological health specialists and research workers for both national and international service. Dr. Russell Morgan, chairman of the National Advisory Committee on Radiation will head the department.

*Ph.D. in Administrative Medicine.* Columbia University's School of Public Health and Administrative Medicine will offer a new degree program to provide essential training for research in administrative medicine, beginning with the 1960-61 academic year. This program, like all Columbia Ph.D. programs, will

be administered by the graduate faculties of the university.

It is anticipated that qualified applicants will be chosen from those with previous training in administrative medicine, public health, medicine, or the social sciences. The program offered should equip graduates for research careers, for teaching positions, or, in certain specialized situations, for positions in the practice of administrative medicine demanding deep insights and wide responsibilities.

Further information on the program, and admission requirements, may be obtained from Dr. Ray E. Trussell, director, Columbia University School of Public Health and Administrative Medicine, 600 W. 168th St., New York 32, N.Y.



# Soviet-American Discussions on Poliomyelitis Control

*Certain views expressed in this statement have been modified by developments noted in the statement by Surgeon General Leroy E. Burney, pp. 869-871.*

**I**N PARTIAL fulfillment of an agreement between the Ministry of Health of the U.S.S.R. and the Public Health Service for the exchange of views and information regarding matters of health, a meeting was held in Moscow, May 12-16, 1960, to discuss problems relating to the control of poliomyelitis. In attendance were 28 participants, 15 from the Soviet Union and 13 from the United States.

## **Session I**

The first session, May 12, 1960, was devoted to Russian experience with the live attenuated vaccine strains of Sabin. A published preliminary report of their mass administration in the U.S.S.R. had been made available to the participants, and Dr. M. P. Chumakov (Institute for Poliomyelitis Research, Academy of Medical Sciences (AMS), U.S.S.R.) opened with comments on their experience. He emphasized that the decision to offer vaccine to all persons aged 2 months to 20 years in the U.S.S.R. was made only after thorough discussions of sequentially larger trials, first with Sabin's original lots and later with Soviet-produced progeny lots which had confirmed prior claims as to safety and capacity to induce antibody development. Observations related to the vaccination of 15 million children during 1959 permitted Dr. Chumakov to draw certain definite or tentative conclusions and to delineate problems requiring further study. Since an estimated 700,000 triple negatives had received vaccine without detected ill

effect and since study of 1,000 paired serums had indicated a high rate of sero-conversions, safety and serologic effectiveness are felt to have been fully demonstrated. Also, convenient and effective methods for administration have been developed. Although observation for another 2 or 3 years is necessary to provide final confirmation, observations in the latter half of 1959 in Estonia and Lithuania as to epidemiological effectiveness encourage Dr. Chumakov to hope for a radical solution of the problem of poliomyelitis in the U.S.S.R. within 1 or 2 years. Important remaining problems include interference by other enteroviruses, duration of immunity, and final proof of epidemiological effectiveness. For the future, annual trivalent revaccination is planned until the duration of immunity is established. Also, recently born children will be vaccinated systematically.

In a second presentation, Prof. O. V. Baroyan (Ivanovsky Institute of Virology, AMS) described a placebo-controlled trial of the Sabin vaccine. Available data confirm the negligible occurrence of reactions or poliomyelitis related to vaccination, but another year of observation is required to provide evidence regarding epidemiological effectiveness. If vaccine did indeed provoke disease, the cases did not exceed 7 per 1 million.

The related discussion revolved about a number of principal points. Regarding safety, the major concerns were the problem of distinguishing poliomyelitis cases possibly provoked by vaccine from those due to wild viruses and the significance of virus reversion to neurovirulence during human passage. In relation to effectiveness, including duration of immunity, several necessary aspects were stressed, includ-

ing continuing intensive surveillance for clinical disease, periodic sampling for persisting sero-immunity, and continuing virologic surveillance to determine the prevalence of polioviruses. Significant frequency of poliovirus isolates would seem to indicate inadequate intestinal resistance, regardless of antibody persistence, or too many unvaccinated persons. In either case, in the view of Dr. Albert B. Sabin (director of the Children's Hospital Research Foundation in Cincinnati, whose name is carried by the live vaccine), further vaccination would be indicated in an effort to break the chain of wild poliovirus transmission. Sero-response to live vaccine is said to be more rapid and more consistent than to Salk vaccine. The special difficulty of evaluating effectiveness when vaccine is given during an epidemic was pointed out. The U.S. participants were particularly interested in the methods developed for vaccine administration and in how the high general level of popular acceptance was achieved in the U.S.S.R. Finally, it was indicated that contraindications had been specified initially on a priori grounds, but that many have been removed as the result of observations during the emergency use of vaccine in the Tashkent epidemic.

Unfortunately, the experience of Prof. A. A. Smorodintsev was not discussed because he was not able to attend.

## Session 2

At the session on May 13, in a series of reports, a number of the U.S. participants described some of the current research in poliomyelitis in their country.

Dr. Roderick Murray (chief of the Division of Biologics Standards, National Institutes of Health, Public Health Service) opened by presenting the preliminary recommendations developed by the Committee on Live Poliovirus Vaccine appointed by the Surgeon General of the Public Health Service, concerning the basis of selection of attenuated poliovirus strains for human vaccination and the licensing of live poliovirus vaccines so as to assure safety, immunogenicity, and purity. The important criteria for strains selection are: (a) full documentation of the origin of the strain; (b) neurovirulence in monkeys inoculated by the intrathalamic and

intraspinal routes to be no greater than that of a reference strain which is subject to selection; (c) sufficient genetic stability that strains undergo no significant (word significant yet to be defined in terms of the total experience) change during human passage; (d) uneventful use in the field trials including at least 100,000 triple-negative persons; and (e) evidence that, in the recommended dosage, the strain will infect and induce antibody formation in at least 90 percent of susceptible persons. For licensing, the manufacturer must show consistent ability to meet established standards by producing at least five successive satisfactory lots. Prescribed control measures, to be described later, are intended to insure potency and exclusion of harmful adventitious agents. Information still needed by the committee relates to: (a) significance of observed reversion to neurovirulence; (b) evidence of epidemiological effectiveness; (c) firm dosage recommendations especially for very young children; and (d) more definitive evidence regarding the safety for all candidate strains.

Dr. Sabin described several recent studies. Rapid mass vaccinations with trivalent vaccine in Toluca, Mexico, seem to have revealed a way to vaccinate successfully in the massive presence of other enteroviruses. In New York, Cleveland, New Orleans, and Nashville, immunization of newborn and older infants is under study. Although the data are incomplete, it is already clear that trivalent feeding of newborn infants is unsatisfactory because the type 2 virus multiplies predominantly. However, when only type 1 vaccine was fed, multiplication was demonstrated in 90 percent of newborn children. Nonetheless, a decision regarding its use in newborns is being postponed until further evidence is obtained of antibody and intestinal resistance to reinfection at 6 months of age. Several strains, representing all three virus types, have been completely freed of monkey neurovirulence by selective propagation at 25° C. Unfortunately, the type 1 and type 2 "cold mutant" strains have little or no ability to multiply in the human intestine; however, the type 3 strain does multiply but requires further study. At present in progress is a large-scale vaccination program intended to reach all school and preschool children in

## Participants

U.S. participants in the Soviet-American discussions on poliomyelitis, which took place in Moscow May 12-16, 1960, were: Dr. M. Benyesh-Melnick, Baylor University School of Medicine, Houston, Tex.; Dr. Theodore Boyd, National Foundation, New York City; Dr. Victor Cabasso, Lederle Laboratories, Pearl River, N.Y.; Dr. Eugene Flipse, School of Medicine, University of Miami, Miami, Fla.; Dr. John P. Fox, Institute for Public Health Research, New York City; Dr. Thomas Francis, professor of epidemiology, University of Michigan, Ann Arbor; Dr. Hilary Koprowski, Wistar Institute, Philadelphia; and Dr. Herman Kleinman, Minnesota Health Department, Minneapolis.

Dr. Alexander Langmuir, Communicable Disease Center, Public Health Service, Atlanta, Ga.; Dr. Joseph E. Melnick, professor of virology and epidemiology, Baylor University School of Medicine, Houston, Tex.; Dr. Roderick Murray, Division of Biologics Standards, National Institutes of Health, Public Health Service; Dr. David E. Price, Assistant Surgeon General, Public Health Service; and Dr. Albert B. Sabin, director, Children's Hospital Research Foundation, Cincinnati, Ohio.

Participants from the U.S.S.R. included the follow-

ing from the Academy of Medical Sciences: Dr. V. M. Zhdanov, Academic Secretary; in the Institute for Poliomyelitis Research, Moscow, Dr. M. K. Voroshilova, chief of the Laboratory of Immunology; Dr. S. G. Dzagurov, deputy director of production; Dr. N. A. Zeitlyonok, deputy director of scientific research; Dr. V. A. Lashkevich, chief of the vaccine laboratory; Dr. A. A. Smorodintsev, chief of the Department of Virology, Institute of Experimental Medicine, Leningrad; Dr. A. V. Tyufanov, chief of the Laboratory of Pathomorphological Control of Vaccine; and Dr. M. P. Chumakov, director; and in the Ivanovsky Institute of Virology, Moscow, Dr. O. V. Baroyan, chief of the Department of Epidemiology; and Dr. P. N. Kosyakov, director.

Other U.S.S.R. participants were Dr. O. G. Anjaparidze, director of the Institute of Virus Preparations, Moscow; Dr. N. N. Ginsburg, deputy scientific director, State Control Institute for Medical Biologists; Dr. Y. D. Lebedev, assistant state general inspector, and Dr. L. A. Sakvarelidze, chief of the Department of Epidemiology, Ministry of Health, Moscow; and Dr. V. D. Soloviev, chief of virology, Central Institute of Advanced Courses for Physicians, Moscow.

Cincinnati. A similar program is about to begin in Rochester, N.Y.

Dr. Alexander Langmuir (Communicable Disease Center, Public Health Service) described the recent increase in poliomyelitis in the United States and, in some detail, the 1959 epidemic in Des Moines, Iowa. This outbreak, similar to many other recent outbreaks, was characterized by a change in the epidemiological pattern from that which existed prior to 1955. Lower socioeconomic and poorly vaccinated groups were more severely affected, and attack rates were even higher than previously seen in upper economic groups. He expressed his belief that lack of vaccination in the lower economic groups determined the shift, but that the very high rates probably reflect a change in character of the virus, possibly resulting from restriction, due to vaccination, of the spread of less virulent strains. Several members disagreed with this interpretation.

Dr. Victor Cabasso (Lederle Laboratories, Pearl River, N.Y.) described laboratory studies with the Lederle-Cox strains and other strains which confirmed reports of others, including Dr. Sabin, that the common genetic

markers, d, T and MS, do not invariably correlate with neurovirulence and hence should not be referred to as virulence markers. Dr. Joseph E. Melnick (Baylor University School of Medicine) followed by reporting studies of both wild strains and isolates from persons receiving vaccine strains which show that while no single marker is correlated with neurovirulence, changes in one and especially in two markers are associated with a trend toward increased neurovirulence. He pointed out that testing for such in vitro changes is useful in selecting isolates from vaccines for neurovirulence tests in monkeys.

Field trials with the Lederle-Cox strains in Minnesota and Florida were described by Dr. Herman Kleinman (Minnesota Health Department) and Dr. Eugene Flipse (University of Miami School of Medicine). These will have involved about 500,000 persons and include such interesting features as placebo controls and tests for viremia in Minnesota and the search for spread and for influence on wild viruses in Florida. A single administration of trivalent vaccine was reported by both speakers as inducing high rates of sero-conversion.

Finally, Dr. John P. Fox (Institute of Public Health Research, New York City) reported studies of the spread of the Sabin vaccine strains in households and communities in Louisiana. While low economic status (associated with poor household hygiene), young age of the vaccinee, use of the type 3 strain, possibly pharyngeal excretion of virus, and, in the community, heavy seeding of the child population all favor vaccine virus spread, the dominant fact is that the vaccine strains spread much less extensively than the more infective wild strains and tend to die out well before the supply of susceptibles is exhausted. Further, contact infections often are abortive and fail to induce antibody formation. He suggested that in view of the short life expectancy of vaccine strains in the population, great concern about reversion may not be justified.

### Session 3

The third session was devoted to a discussion of questions of manufacture and quality control as these affected the safety and potency of live poliovirus vaccine.

Dr. Chumakov introduced the discussion by presenting a general account of the system of control which had been the basis for issuing live poliovirus vaccine for general use in the U.S.S.R. He noted that these were based on instructions prepared largely by Dr. A. A. Smorodintsev which were approved by the Ministry of Public Health on November 10, 1958. These instructions were later amended following conferences with U.S.S.R. health officials following a conference held by Dr. Sabin in June 1959 in Cincinnati and later taking into account some of the recommendations made by the Public Health Service Committee on Live Poliovirus Vaccine.

Dr. Chumakov pointed out that in the U.S.S.R. only three Sabin strains were used, and the following principles were included in the production and control of the product in order to assure safety and effectiveness:

1. Identification of the strains used.
2. The use of usually first and rarely second passage from the seed in preparing vaccine.
3. Careful selection and examination of monkeys for disease.

4. Holding monkeys for 6 weeks. Keeping up to seven monkeys per cage has not been found to be a disadvantage.

5. Separate processing of individual kidney pairs.

6. Use of dense tissue culture preparations with heavy inoculums of the cultures during production of vaccine.

7. Incubation at 34° C. during the virus propagation phase.

8. Use of 25 percent of the tissue culture vessels as control vessels and examination of all culture bottles after 3 days' cell growth prior to inoculation as matters which minimize the simian agent problem.

9. Testing each lot for neurovirulence in monkeys by intracerebral inoculation and every 10th lot by intraspinal inoculation.

10. Performing tissue culture and animal tests designed to pick up various contaminating bacteria and viruses.

11. Carefully determining final virus titers by two methods.

12. In the case of vaccine incorporated into candy, testing up to 110 pieces of candy, randomly selected, for virus content.

Dr. Chumakov indicated that a total of about 4,000 liters of vaccine had been issued; that this represented the production of 61 lots, of which only 4 had been rejected during processing. These rejections were because of positive findings in the intracerebral monkey neurovirulence test. Simian viruses had not been a problem, and B virus had not been encountered.

Dr. Murray briefly summarized the recommendations issued in the United States on November 16, 1959. These followed along parallel lines with some differences. Individual isolation of monkeys was a requirement. Greater emphasis was put on the possible presence of simian and other adventitious agents, and in this connection the test volumes were high; 500 ml. where possible, or 500 recommended doses where neutralizing serums were required in the test. It was emphasized that the extensive experience with tissue-culture testing of killed poliovirus vaccine indicated that simian agents were rather commonly encountered, but that the occurrence tended to be irregular. In addition, the need for the

control of personnel, prevention of entry of extraneous viruses into production areas, and the need for separate facilities for vaccine manufacture were emphasized.

In the ensuing discussion a number of speakers stressed the need for some simple evaluation of safety such as might be presented by an array of markers. There was also emphasis on the important role of continuous epidemiological evaluation in order to support laboratory control measures and because of the possibility that it might be several years before it becomes possible to make a full evaluation of the epidemiological effectiveness of live poliovirus vaccine. By effectiveness is meant prevention of both paralytic disease and circulation of wild polioviruses.

### **Summary and Conclusions**

The occurrence of reactions following the use of these vaccines has been followed in a number of studies, some of which were controlled studies, in the United States and the U.S.S.R. The rate is so low that the product may be considered virtually areactive. Multiplication of virus has not been accompanied so far by any certainly detected evidence of illness. The status of the few cases of poliomyelitis which have occurred shortly after vaccination has not been clarified.

On the basis of the experience with large-scale feeding of the Sabin vaccines, involving some 60,000,000 in the U.S.S.R. alone, no cases of poliomyelitis which could be attributed to the use of these vaccines have been reported from the various areas of the world where they have been used.

On the question of increase in virulence, while there was little direct evidence that this did not occur, the epidemiological information available indicated that this had not been encountered.

Much of the data indicated that live virus vaccines induced antibody formation in a high proportion of susceptible children. Single use of trivalent vaccines, especially in young infants, was often reported to result in lesser frequency of response than that following sequential monovalent feeding, although various workers in both countries have reported satisfactory results.

Vaccination during summer months on occasion has been followed by a significant proportion of failures, possibly because of the interfering effect of other enteroviruses. Evidence exists that rapid initial mass application of trivalent vaccine followed by reapplication may overcome this difficulty.

A hoped-for advantage of live virus vaccination voiced by many participants is intestinal resistance to infection. It has been suggested that, guided by virologic surveillance, periodic revaccination may be practiced annually until this desired level of resistance is achieved.

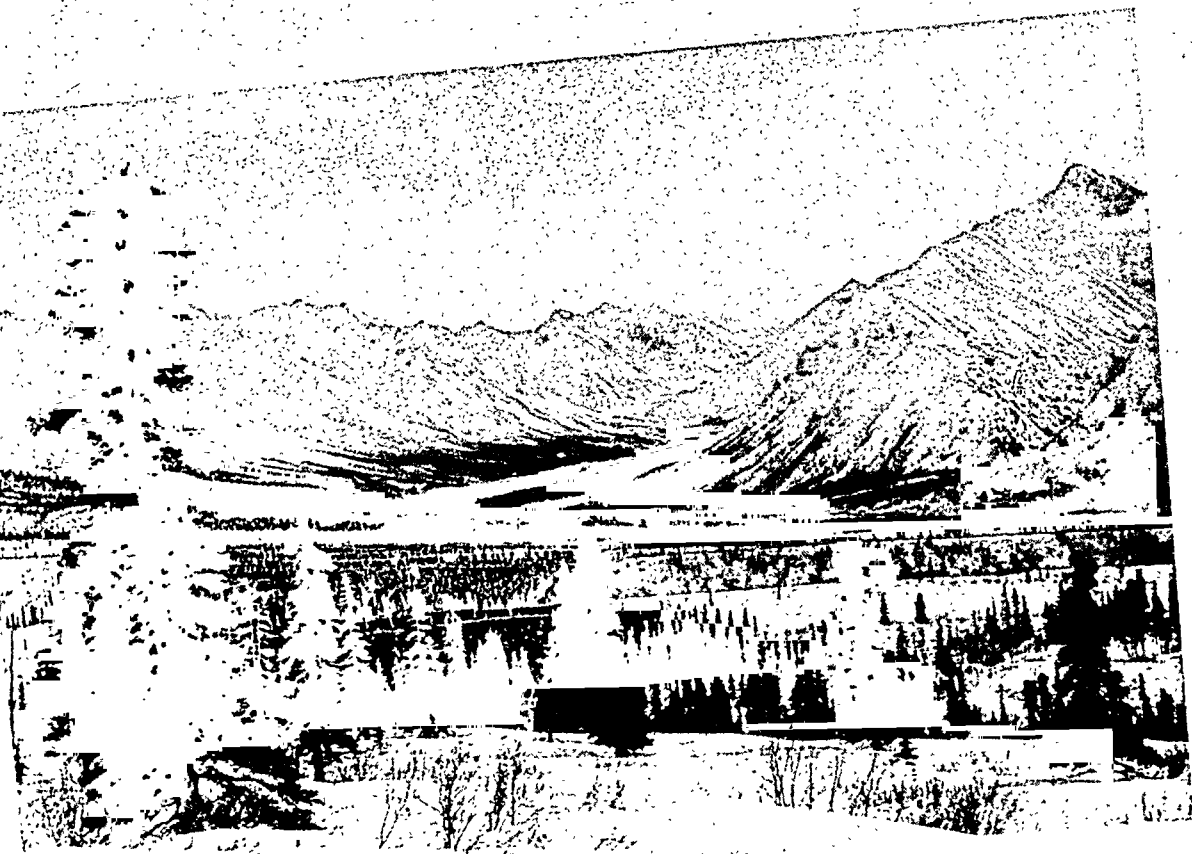
Information regarding duration of immunity is as yet inadequate. To supply this, periodic serologic sampling of the vaccinated population and continued epidemiological and virologic surveillance are essential.

Several observations compatible with significant epidemiological effectiveness have been reported. These include: (a) the unusually low overall incidence of poliomyelitis in the second half of 1959 in the several areas in the U.S.S.R. in which 50 to 60 percent of the population was vaccinated prior to June and (b) the fact that, in the several regions where vaccine was administered during the summer and fall, attack rates in those vaccinated were consistently much lower than in those not yet receiving vaccine. All agreed, nonetheless, that careful surveillance for several more years is necessary to provide full proof of effectiveness.

The production and testing standards in effect in the U.S.S.R. and the United States are parallel in most respects, but there are certain differences.

The existence of these differences suggests the desirability that a comparative study of the different requirements be undertaken by the United States and by the U.S.S.R. so that international recommendations may be formulated by the World Health Organization.

The participants all agree that the work of the conference has been mutually profitable and has laid a firm foundation for the continuing exchange of information and cooperation in the future.—Signed by DAVID E. PRICE, Assistant Surgeon General, Public Health Service, and V. M. ZIMANOV, Academic Secretary of Academy of Medical Sciences of the U.S.S.R., May 16, 1960, Moscow.

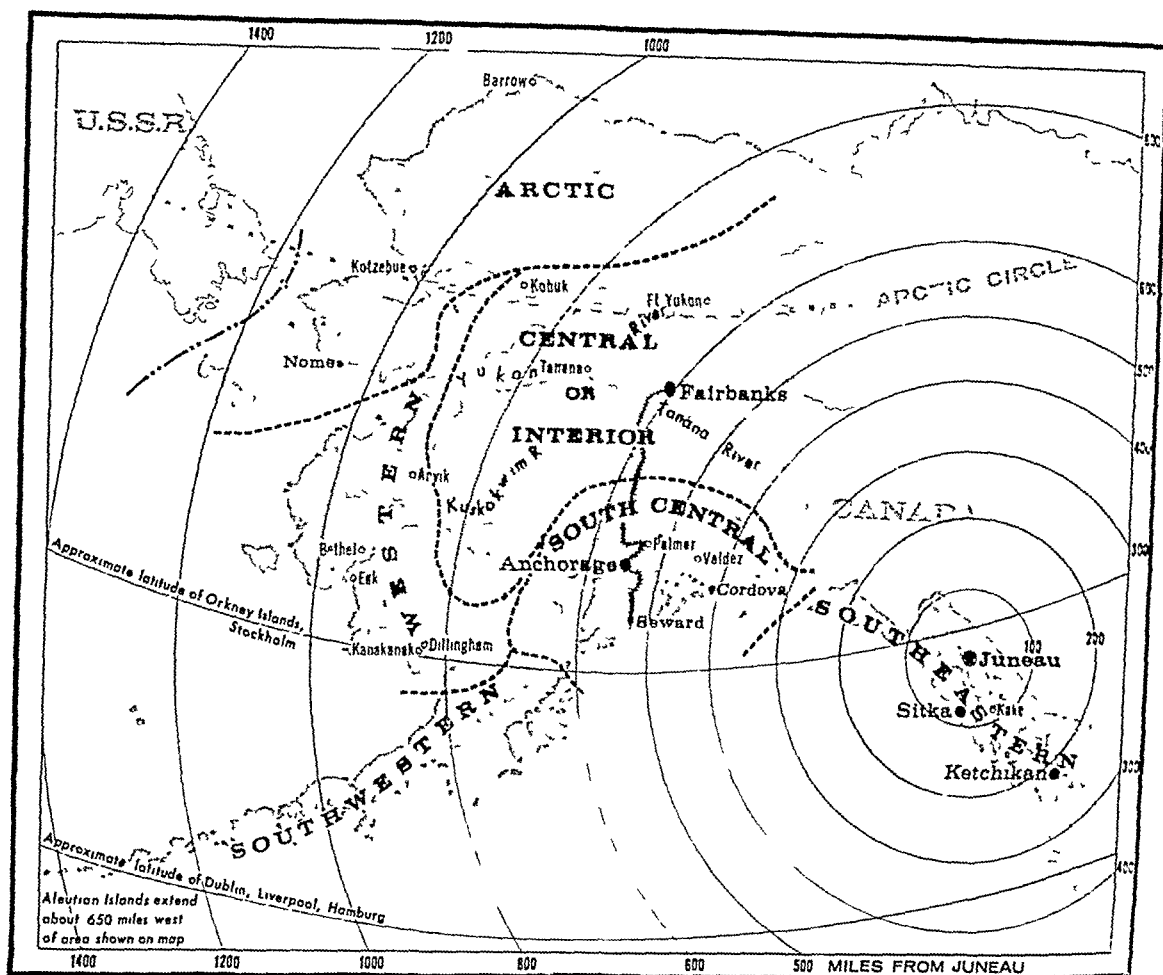


*Chugach Mountains near Anchorage*

*Photograph by J. Malcolm Greany, Juneau*

# ALASKA

frontier  
for  
health  
services



ALASKA is in a particularly critical period. The transition from Territory to State presents complex tasks of organization to be accomplished with as little disturbance of functions as is humanly possible. New sources of revenue are to be tapped. New programs are to be initiated. Established services, formerly provided by Federal agencies, are passing to the State.

Alaska is in many respects still a frontier, undergoing settlement and early growth. A large segment of the population is moving from a primitive hunter's culture to the culture of the nuclear age almost in a single generation. Another segment is composed of transient military personnel and their dependents. The remainder is a complex of established settlers, newcomers, and seasonal workers, with multiplying demands for public services.

A review of Alaska's health at this juncture seems timely.

To readers of *Public Health Reports*, Alaska may suggest that we have under the American flag a unique opportunity for technical assistance to an underdeveloped land. Its challenge to health services opens rare opportunities for research and application of present knowledge.

An even higher consideration is that which motivated Dr. Joseph Mountin (1) and others to advocate the establishment of an Arctic Health Research Center:

"In the past, public health activities have developed in the wake of civilization. Now public health is presented with an opportunity to lead civilization, to pioneer in new fields. By uncovering some of the problems of human life and adjustment in low temperature areas, public health can become a creative force in opening up new frontiers. At the same time, it can make potentially significant contributions to basic knowledge."

The successful development of Alaska as a home and as a resource for a democratic people depends on what is done to promote the health and vigor of all who live and work there, for this generation and generations to come. It is with this thought above all that the following pages consider the status and development of health in Alaska, the largest and the least developed of the 50 States.

## Geography and Climate

From the standpoint of medicine and public health, the most important features of the Alaskan environment are those which influence travel and transportation, communication, construction, and environmental sanitation. Health services in Alaska range over thousands of miles: through climates ranging from the arctic to temperate; from arid to rainy; over glacier, muskeg, volcano, fiord, forest, and frozen plain. Isolated from the main centers of health resources in the United States, Alaskan health services nevertheless bring modern methods to still more isolated settlements, which subsist by hunting, fishing, logging, mining, or herding.

Thanks to aviation and radio, Alaska has succeeded in bypassing many of the physical obstacles of its geography and climate, which formerly made travel hazardous and time consuming and communication uncertain if not impossible. The long distances between settlements, the high mountain ranges, and the expanses of treeless and trackless tundra are no longer as formidable as in years past. In all but the most remote areas, the bush plane is replacing the dog team as the customary means of winter travel for all Alaskans.

All Alaskan bush flights are "WPPW," "weather permitting-pilot willing." For some flights, the plane may take off on wheels and land on pontoons. It may land on a gravel bar in a river, or on frozen tundra, or on a slough or lake. During the fall freezeup and spring breakup travel to outlying areas generally comes to a halt for a few weeks until ground and water conditions stabilize. Construction of additional airfields with surfaced or graveled runways is overcoming the seasonal hiatus, but in remote areas the possibility of seasonal de-

lays from freezing or thawing conditions persists.

The Alaskan bush pilot is often the first to bring back word of outbreaks of disease, food shortages, forest fires, or other disaster. He goes out of his way to check on isolated individuals and to fly in critically needed personnel, food, drugs, or equipment. Between the weekly or biweekly bush flights, dogsleds are usually the only means of winter travel between villages. A few river settlements operate trucks, caterpillar tractors, or snowmobiles on frozen rivers during the winter. A few "Snogoes" (sleds with airplane propellers mounted on the rear) are also used.

In summer, boats with outboard motors travel along the swift, silt-laden streams, through many deltas and sloughs. It takes a skilled navigator to find his way, because the streams may change course from season to season. Kayaks, one-manned, and umiaks, large skin boats, are used by coastal residents for sealing and walrus hunting.

Umiaks, frequently equipped with outboard motors, lighter freight in from the big ships lying offshore along the northwestern coast.

Microwave transmission of long-distance telephone calls, broadcasts, and shortwave radio have speeded up messages. The Army Signal Corps operates the telegraph and long-distance systems in Alaska. Exchanges which only a

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*Data and information on which this report is based were obtained from both published and unpublished reports and records and by personal interviews or communications with staff members of State and Federal agencies and organizations. The State agencies were the Alaska Agricultural Experiment Station and the Alaska Department of Health and Welfare. Federal agencies, all within the Public Health Service Hospital, Anchorage, and the field office, Mount Edgecumbe, both of the Alaska Native Health Service, Division of Indian Health, Bureau of Medical Services, and the Arctic Health Research Center, Bureau of State Services. Statistical data are the most recent figures available as of May 1960. Mrs. Rachel Simmet, special assistant to the director, Arctic Health Research Center, Anchorage, was principally responsible for the acquisition, compilation, and presentation of this information.*



few years ago required days or weeks are completed in minutes or, at most, hours. For example, in a few minutes a public health field nurse may learn that a hospital bed is available for a patient waiting in Sleetmute, and the patient may be brought to the hospital, weather permitting, within a few hours or a few days. Regular longwave broadcasts also carry personal messages which might otherwise be delayed.

Physicians at field hospitals hold regular daily conferences by radio, answering questions and giving instructions for teachers, missionaries, and village leaders.

Alaska's highway and railway facilities, access roads, and airfields are being extended in anticipation of population needs. Present systems of travel and communication in general demonstrate high achievements against extreme odds.

Actually, there are only two phenomena which are truly peculiar to northern regions. Extremely low temperatures, invariably regarded as the outstanding feature of Alaska, also occur in many of the northern States lying along the Canadian border. But permafrost and extreme periods of darkness and light occur only in the arctic and subarctic. Permafrost, a major obstacle to Alaskan development despite years of study and experiment, is the layer of permanently frozen ground which underlies a considerable portion of all land masses bordering on the Arctic Ocean. About 60 percent of Alaska's 586,000 square miles is underlaid by this frozen layer. This frozen earth is hard to excavate, and once thawed on the surface there is no drainage through the frozen layer beneath. Wells and sewer or water pipes running through the permafrost will freeze unless special precautions are taken. The foundations of highways and buildings often settle or heave as a result of disturbances in the permafrost. Other specific effects of permafrost are discussed below.

The second environmental factor peculiar to northern latitudes is the light cycle which gives Alaska its long summer days and long winter nights. While the specific effects of protracted light or darkness on human beings have been investigated only to a limited extent, there has

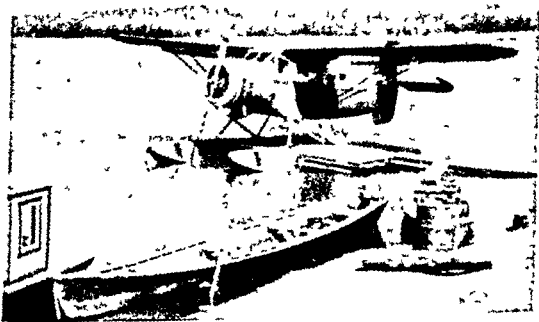
been considerable speculation concerning the relation of the long nights to mental health. A condition popularly known as "cabin fever" is sometimes ascribed by amateur Alaskan psychologists to the period of winter darkness, but no scientific evidence has been assembled to support or contradict this theory. Studies are underway to determine the effects of the protracted length of summer days on certain public health procedures, such as the operation of sewage oxidation ponds.

## Population

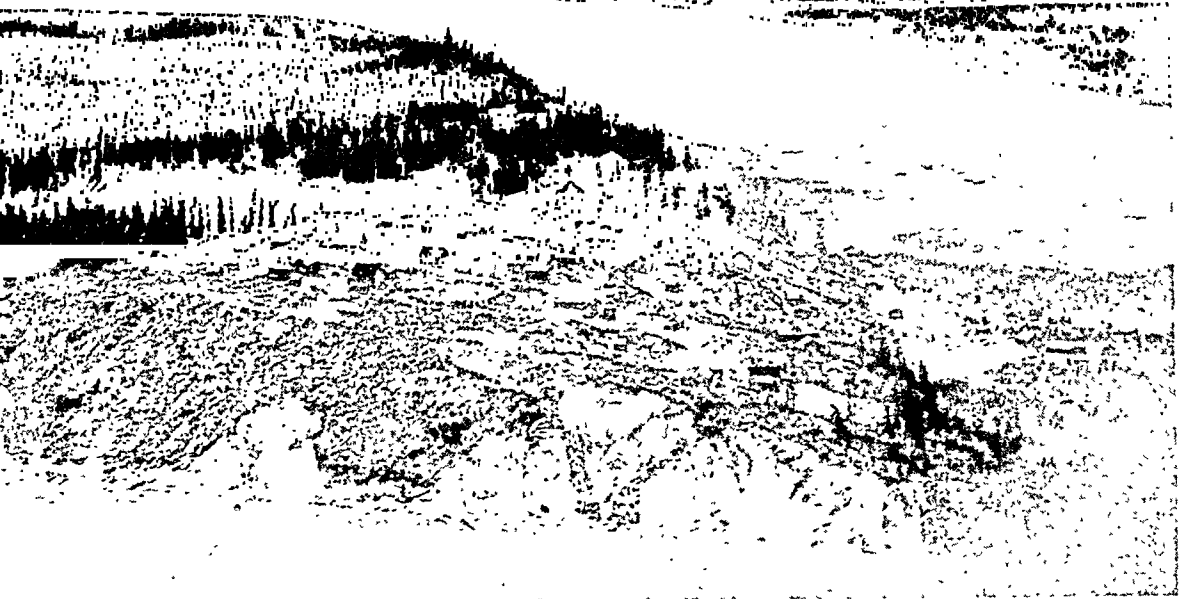
In general composition as well as in the more specific characteristics of age, heredity, sex, geographic distribution, and mobility, the Alaskan population is in a class by itself. For this reason, comparison of Alaskan data with data for other States or for the United States as a whole, while inevitable, is unlikely to lead to sound conclusions unless Alaska's unique population and environment are also evaluated.

Certain basic characteristics of the general Alaskan population have had special bearing on health and medical care programs.

The presence of aboriginal groups in varying stages of acculturation and economic independence, for example, has encouraged Federal fi-



Float plane on Yukon River at Anvik. River boats and float planes both use Alaska's waterways. When waterways are frozen, dog teams travel on them and ski planes land on them. Itinerant public health nurses, sanitarians, and clinic personnel, as well as patients going to and from hospitals, must "make connections" between small and large craft.



Bureau of Indian Affairs school and village of Noorvik on the Kobuk River in far northern Alaska. In background is part of the vast "Arctic bog," which explains why travel in Alaska is by air, river boat, or dogsled.

nancing of medical care and facilities for such Alaskans. With establishment of parallel services and facilities for other residents, administrative functions in many instances have overlapped in the past.

The word "native" is used in the following pages to designate members of the three aboriginal groups in Alaska as differentiated from individuals born in Alaska of nonaboriginal parents. The term "white" as used in Alaskan data includes a small number of American Negroes and Filipinos as well as Alaska-born white residents and immigrants.

The native population includes an estimated 18,000 Eskimos, 16,000 Indians, and 4,000 Aleuts. The Eskimos, unlike the Indians, have no tribal or clan organization and are generally classified as coastal or inland Eskimos, or by the name of the specific area which they inhabit, such as Brooks Range, Bering Sea, or Pacific Eskimos.

The Indians of southeastern Alaska comprise three tribal groups: Tsimshian, Tlingit, and Haida. Indians of interior Alaska belong to the Athabaskan, or Athapaskan, tribe, with subsidiary groups also designated by location, as, for example, Copper River or Koyukon (Koyukuk and Yukon Rivers) Indians.

The Aleuts, smallest of the three aboriginal groups, are found chiefly in villages of the Alaska Peninsula and the Aleutian Chain.

Alaska has many excellent native artists and craftsmen. Years of dependence on their environment for a livelihood have made them expert observers and reporters of Alaskan natural history and wildlife, with remarkably accurate memories. They have proved to be excellent mechanics, pilots, and scouts, and have made notable contributions to the national defense through service in the Armed Forces, with the Alaska National Guard, and as construction workers on the DEW (distant early warning)

line and White Alice (communications network) installations in remote areas. Nine of the 60 members of the first State Legislature were natives: 6 were Eskimo, 2 Indian, and 1 Aleut. An Eskimo was also elected president of the first State Senate.

For many years now, a high proportion of the wage earners in Alaska have been Federal employees, both military and civilian. This has had considerable influence on local and state-wide health programs. Most of the health and medical needs of the individual military man and his dependents are met by services and facilities available only to the military population. Some of the Federal agencies, such as the Alaska Railroad and the Federal Aviation Agency (formerly Civil Aeronautics Administration) have had their own staff physicians. The Alaska Railroad also maintained a separate hospital for many years. Exclusion of these groups has limited the base of financial support for community facilities and services, and has upset the population ratios used in determining per capita needs and financial resources.

The bulk of the Alaskan population is still made up largely of "transplants," those who were not born in Alaska. The backgrounds of these immigrants, the reasons they have migrated north, and the levels of individual capability, emotional maturity, and resourcefulness which they represent profoundly influence the "tone" and development of the communities in which they settle. The get-rich-and-get-out-quick fortune seeker, who comes north without his family, is content with minimum comforts, contributes little to the stability of any community, and frequently aggravates conventional community problems. The individual who migrates north to "get away from it all" seldom contributes to Alaska's development. Fortunately, the proportion of fortune seekers and escapists among the annual swarm of newcomers is decreasing.

### Age and Sex

Perhaps the most outstanding characteristic of the Alaskan population is its youth. According to a special 1959 Census Bureau compilation, the median age of the civilian population in Alaska is 18.5 years, while the median

age for the United States population as a whole is 30.1. Conversely, Alaska has the smallest number of "senior citizens" of all the 50 States, with only 4.4 percent of the population in the 65 and over age group. This unusual age distribution is important in interpreting mortality and morbidity statistics and in judging the health and medical care needs of Alaskans.

The ratio of males to females in the Alaskan population has decreased in recent years. In 1950, the ratio was down to 162 males per 100 females and has decreased more since then. A large proportion of women are of childbearing age, and the high birth rate is responsible in large measure for the increase in Alaska's population.

### Geographic Distribution

Fewer than a quarter million people reside in Alaska. By comparison, Scandinavia and Finland, which closely resemble Alaska in extent and to a considerable degree in climate, had a total estimated population of nearly 19 million in 1957-58 (2).

Most of Alaska's present population is concentrated in the vicinity of the four major cities, Ketchikan, Juneau, Anchorage, and Fairbanks, in many small towns and villages along the Pacific, Bering, and Arctic seacoasts, and along the two main rivers, the Yukon and the Kuskokwim.

Alaska has the lowest population density of all the States, with about one person to each 3 square miles. Even with continued growth, such as the 51 percent increase in civilian population between 1950 and 1957, it seems likely that the present pattern of population distribution in Alaska will persist, with the highest concentrations along the temperate coastline and in certain sections of interior valleys.

The 38,000 Indians and Eskimos for the most part live in small, widely dispersed settlements, following early cultural patterns of location and occupation, while newcomers (cheechakos) favor the towns. This basic pattern of distribution has been modified to some extent by technological and cultural changes. As the wildlife resources have dwindled, many native hunters and fishers have migrated to larger communities in search of wage labor. Until

comparatively recent times, the only non-native residents in most of the small coastal and river villages were school teachers, missionaries, traders, or U.S. commissioners. With the expansion of defense construction activities and establishment of Federal Aviation Agency facilities in outlying areas, more and more cheechakos have moved into remote areas. Even in the most isolated regions, there are now few entirely native villages, and in the majority of the settlements most of the native residents, except perhaps the elders, understand and speak English in addition to their own language. Few of the newcomers, in contrast, have succeeded in mastering the Eskimo and Indian dialects.

The rate of acculturation among native groups has varied with geographic location. The ease and speed of cultural transition have been determined largely by the extent of exposure to the white man's industrial culture. Thus, among the Indians of southeastern Alaska, the process of acculturation has taken place far more rapidly and more thoroughly than among the Eskimos living along the Bering Sea and the Arctic Ocean. The transition from subsistence fishing of the early southeastern Indians to employment in commercial fisheries has been far easier than the changes implied for the Eskimo's shift from hunting seal or walrus to dependence on limited opportunities for unskilled wage labor in northwest Alaska (3).

Despite the lack of highway and railroad facilities, the Alaskan population is unusually mobile. Seasonal fluctuations in employment in the construction and fishing industries account for much of the traffic between Alaska and other States. There is also considerable population movement within Alaska. In former years, the entire population of many villages customarily moved in season, to summer fishing camps in the spring, to muskrat camps in the fall, or along the winter trail of the caribou herds. Seasonal shifts have decreased to some extent in recent years. As improvements in construction methods have extended the building season, more and more construction workers remain in Alaska the year around. Similarly, as schools and post offices are constructed in outlying vil-

lages, nomadic families are less inclined to move away from these fixed facilities. The tendency to "stay put," however, increases the need for sanitation and disease control, and for some formerly nomadic families it has meant limited supplies of food.

### Health and Medical Resources

As in other sparsely settled areas, most of Alaska's health and medical facilities and personnel are located in or near major population centers. This distribution pattern is modified in Alaska by the fact that certain facilities were established specifically to serve the Eskimo, Indian, and Aleut population.

Alaska currently has 28 hospitals and 1 nursing home (table 1), 27 health centers, and roughly about 1,500 to 1,800 professional medical and paramedical personnel, including government and private but excluding military employees, to care for the health and medical needs of approximately 175,000 civilians. In general, per capita ratios of hospital beds and professional personnel are relatively low, and

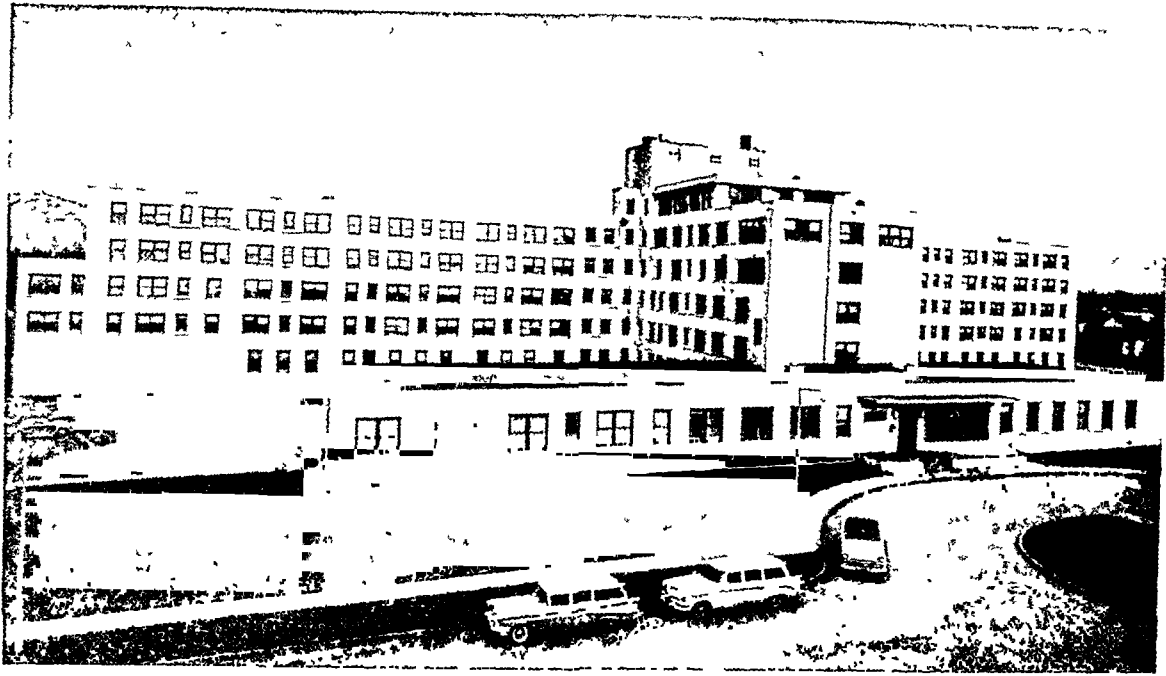
**Table 1. Alaskan medical facilities, by type and bed capacity, 1959-60**

Type of facility	Number	Bed capacity
<b>Federal Government:<sup>1</sup></b>		
Public Health Service:		
Referral hospitals.....	2	700
Field hospitals.....	5	180
Outpatient clinics.....	(3)	-----
Fish and Wildlife Service hospitals <sup>2</sup> .....	2	14
<b>Total.....</b>	<b>9</b>	<b>894</b>
<b>Nongovernment:</b>		
Church:		
General hospitals.....	9	381
Chronic disease hospitals.....	1	16
Community general hospitals.....	8	137
Other:		
White Pass and Yukon Hospital <sup>3</sup> .....	1	8
Private nursing home.....	1	15
<b>Total.....</b>	<b>20</b>	<b>557</b>
<b>Grand total.....</b>	<b>29</b>	<b>1,451</b>

<sup>1</sup> Excluding military hospitals.

<sup>2</sup> Hospitals in Pribilof Islands are staffed by the Public Health Service and operated by the Fish and Wildlife Service.

<sup>3</sup> Railroad.



Alaska Native Health Service Hospital, Anchorage

the distribution of these resources among population groups is somewhat uneven. There are, however, certain factors which offset these apparent deficiencies. One is the unusual age distribution. The population is, on the whole, young and healthy. Second, many Alaskans are still inclined to go "outside" for major surgery or for treatment of long-term illnesses. But the demand for specialized services and facilities located within Alaska is increasing.

Statistical analysis of health and medical resources in Alaska is difficult, because agency functions tend to overlap, and staffing patterns of government agencies vary. As a result of changes brought about by statehood, the general organization and relationships of Federal and State health agencies in Alaska are in a state of transition. The two chief agencies concerned with civilian health are the Division of Health of the Alaska Department of Health and Welfare and the Public Health Service including both the Alaska Native Health Service and the Arctic Health Research Center.

None of the military medical and health resources in Alaska is included in the analysis, since these are available to the general public on an emergency basis only. Special mention should be made, however, of auxiliary services

provided by the Alaska Air National Guard, Civil Air Patrol, Coast Guard, Air Force, and Navy, which are frequently called on for aid in searching for downed military and civilian aircraft, to provide emergency transportation for ill or injured residents, or to transport medical and nursing personnel in case of emergency.

#### Federal Government Facilities

The Public Health Service, in addition to providing medical care for Alaska's natives, has pioneered in studying Alaska's health needs through the Arctic Health Research Center, Bureau of State Services, in cooperation with the Division of Health, Alaska Department of Health and Welfare, and other agencies and organizations in and outside Alaska.

The Public Health Service's Bureau of Medical Services, through its Division of Indian Health, is the unit of Federal Government responsible for providing medical care for the Eskimos, Indians, and Aleuts of Alaska. The activities of the Alaska Native Health Service program of the Division of Indian Health are under the administrative supervision of the area office located at the ANHS hospital in Anchorage. A field health office at the Mount Edge-

cumbe hospital directs the program in southeastern Alaska.

Under the immediate supervision of the Mount Edgecumbe field health office is the 300-bed hospital at Mount Edgecumbe near Sitka, and an outpatient clinic at St. Ann's Hospital in Juneau. Under the Anchorage area office are a 400-bed hospital in Anchorage, five field hospitals distributed throughout northern, western, and central Alaska, and two hospitals operated by the Fish and Wildlife Service on the Pribilof Islands.

In addition to supervising the operation of the hospital at Anchorage and the five field hospitals, the Anchorage area office has a staff of program specialists who direct a comprehensive program related to their individual fields, as well as acting as consultants to Public Health Service field personnel and installations. Through joint effort with the Division of Health, Alaska Department of Health and Welfare, the area office is providing public health nursing and sanitation aide services to native villages under contractual arrangements. The State tuberculosis control program is also jointly supported by the Alaska Native Health Service of the Division of Indian Health, by provision of monetary aid and by direct support of two of the three airborne chest X-ray survey teams serving the State.

The Mount Edgecumbe field health office supervises school health programs at the Mount Edgecumbe School, the only native boarding high school in Alaska, and at Wrangell Institute, a boarding school covering grades 1-8, to which native children are sent from remote villages where no schools are available at present.

Although tuberculosis among the Alaskan natives has been drastically reduced (see table 7), thus diminishing the need for tuberculosis beds, the increased number of patients who need medical and pediatric beds is more than enough to occupy existing hospital facilities, as well as facilities to be replaced at Kotzebue and Barrow. The changing trend from relatively inexpensive long-term care of tuberculosis patients to care of patients with acute general medical and surgical conditions poses several problems. Among these are the fact that a general hospital requires more personnel of more types than a tuberculosis hospital, the cost of transporting

the increased number of patients served by a general hospital, and remodeling of facilities.

In order to meet the objective of the Division of Indian Health to elevate the health status of the Alaskan natives to a level comparable with that of the general population of the State, other facilities, such as field health clinics, are also needed. Some field health clinics are already being held by Public Health Service doctors and public health nurses in schools and other temporary quarters in some of the villages; however, no fixed installations are available in many of the smaller villages. The plan is gradually to establish permanent facilities in strategically located areas so that more preventive as well as direct medical care can be made available to the beneficiaries. Fort Yukon will probably have the first such establishment in Alaska.

It has been frequently suggested that Public Health Service field hospitals be open to non-native residents of Alaska, particularly in communities where no other facilities are available. Hospital and outpatient medical and dental care are currently provided in emergency situations only. These non-native patients are requested to reimburse the Public Health Service for the care received, under set scheduled fees or at hospital cost-per-diem rates. This method of operation has been approved by the Alaska State Medical and Dental Associations as well as the Alaska Hospital Association.

Research in Alaska by the Public Health Service is primarily concerned with investigating and, where possible, devising solutions to the many and varied health and medical problems peculiar to the region. This program, conducted by the Bureau of State Services' Arctic Health Research Center at Anchorage, was established by act of Congress in 1948. Initiation of the research program was recommended by two survey teams from the American Medical Association which visited Alaska in 1946 and 1947, with strong endorsement from the Territorial department of health and other Territorial and Federal agencies concerned with Alaska's health.

The Arctic Health Research Center is the only research facility in Alaska with a resident staff devoting full time to health studies. Long- and short-term studies involving field and labora-

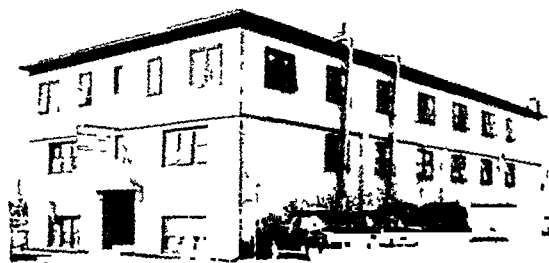
tory investigations in biochemistry and nutrition, entomology, environmental sanitation, epidemiology, physiology, and zoonotic disease are in progress at AHRC. Many of the study projects are pursued in cooperation with the Division of Indian Health, the Alaska Native Health Service, and the Alaska Division of Health. Direct support is provided for investigations in environmental sanitation and epidemiology by the Division of Indian Health. The National Institutes of Health provides partial support for studies in certain fields.

### State Government Facilities

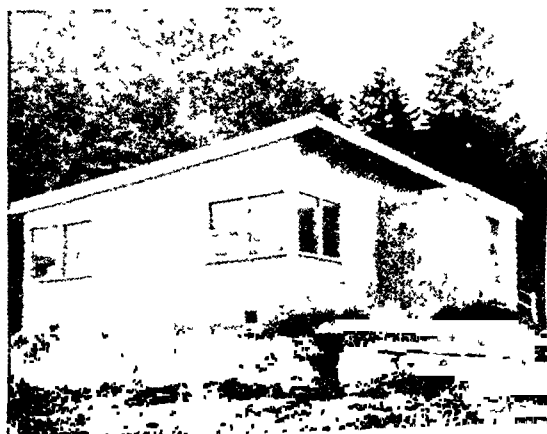
The Division of Health of the Alaska Department of Health and Welfare maintains 27 health centers, which constitute the front line of its health activities. Located in small villages as well as urban communities, these centers serve as headquarters for nursing and sanitation personnel between visits to outlying villages. The visits by public health nurses and sanitarians constitute the most arduous and critical health services in Alaska. As noted above, travel conditions are often trying. Accommodations in bush planes are so restricted that passenger size becomes a critical factor in recruiting field personnel.

Since many villages are remote from a field hospital, nurses during their visits often provide emergency aid in addition to routine services. Although housing facilities are being improved, it is not unusual for a visiting nurse or other field visitor to bed down in a sleeping bag on the floor of the school house or trading post.

Many of the health centers and itinerant nursing services were established several years ago by the Office of Indian Affairs, Department of the Interior, as extensions of the field hospitals, primarily for native beneficiaries. As rapidly as finances permit, the Alaska Division of Health is taking over these units and is adding new ones, to provide services for all residents of as many villages as possible. As the health centers and itinerant services are transferred to the Alaska Division of Health, the Public Health Service Division of Indian Health continues to finance the itinerant nursing and sanitation programs on a contractual basis.



Main laboratory building, Arctic Health Research Center. Anchorage



Health center. Kake, June 1958. This health center provided the first adequate quarters for itinerant nurses in this southeastern Alaska village.

Federal funds have been appropriated for construction of a 225-bed State mental hospital at Anchorage, and additional funds have been allocated by the State Legislature for conversion of existing hospital facilities at Valdez for care of custodial mental patients.

The Alaska Division of Health maintains four laboratories, a central laboratory at Juneau and three regional laboratories at Ketchikan, Anchorage, and Fairbanks. The four units provide comprehensive, modern public health laboratory services for the entire area of Alaska. Jointly they supply the bacteriological, serologic, parasitological, radiological surveillance, sanitary bacteriological, and microbiological services essential to the operation and administration of the Division of Health programs.

In addition to routine processing of speci



Alaska Native Health Service field hospital. Kotzebue

mens sent in by physicians, health officers, public health nurses, and hospitals located in their respective cities, each laboratory receives specimens from numerous villages within a sizable radius. Limited investigative studies are included in the programs as far as routine specimen loads permit. These include the study of newer and more efficient laboratory methods, the scientific analyses of routine laboratory findings, and limited laboratory research on public health conditions peculiar to Alaska.

Special and reference microbiological examinations, including animal pathogenicity studies, are provided through the Division of Health laboratories by the Public Health Service Communicable Disease Center in Atlanta,

Ga., and nearby States. A limited amount of special bacteriological, virological, and serologic service is provided by the Infectious Disease and Animal-borne Disease Laboratories of the Arctic Health Research Center.

There are only two resident pathologists in Alaska. One has a small private laboratory in Anchorage; the other is an Air Force officer assigned to Ladd Air Force Base in Fairbanks, who frequently serves as consultant at the Public Health Service hospital in Anchorage. A pathologist from the State of Washington travels to Ketchikan periodically to provide consultation. Many private physicians still send all their pathological and some of their clinical specimens to diagnostic laboratories



outside Alaska. Public Health Service field hospitals maintain small laboratories for simple diagnostic tests, forwarding specimens requiring elaborate processing to laboratories at the Public Health Service hospitals at Anchorage and Mount Edgecumbe.

Private hospitals and physicians' clinics in both the larger and the smaller communities operate clinical laboratories, some of which do only simple diagnostic tests, relying on the larger laboratories for reference and the more exacting procedures.

The Division of Health, in cooperation with the Alaska Society of Medical Technologists, has organized several workshops, conducted by laboratory consultants from the Public Health Service Communicable Disease Center, to expand and improve public health and clinical laboratory services throughout the State.

#### ***Private Facilities and Agencies***

There are 20 private hospitals and several private medical clinics listed in Alaska. Eighteen of the 20 institutions are classified as general hospitals; one is a chronic disease hospital (Wesleyan Hospital, Seward), and one is a nursing home in Anchorage. Two of the general hospitals are currently closed either because of lack of operating funds (Hudson Stuck Memorial Hospital at Fort Yukon), or inability to recruit and keep staff (Valdez Community Hospital). A total of 526 general hospital beds are therefore available in 16 currently operating hospitals for the care of approximately 137,000 non-native civilian residents of Alaska. Of these 16 private hospitals, only two are located in the whole of interior and northern Alaska, at Fairbanks and Glenallen, and one in western Alaska, at Nome. Six are located in or near Anchorage and the Kenai Peninsula, at Palmer, Anchorage, Seward, Homer, Seldovia, and Kodiak, one at Cordova, and the remaining six in the southeastern Panhandle, at Ketchikan, Wrangell, Petersburg, Sitka, Juneau, and Skagway.

Of the 526 private hospital beds available, 163 are currently classified as "unsuitable" by the Alaska Division of Health. Entire hospitals have been so classified in four communities, usually on the basis of age or type of construction or both.

Ten voluntary agencies supplement official health activities in Alaska. The Alaska Crippled Children's Association and the Alaska Tuberculosis Association have vigorously supported official agency efforts to combat tuberculosis and accompanying orthopedic problems for many years. Two Alaskan groups, the Eye, Ear, Nose, and Throat Foundation of Alaska, and PARCA (Parents' Association for Retarded Children of Alaska), more recently formed, are actively promoting development of research, diagnostic, and treatment programs in their respective fields. The cerebral palsy program of the Alaska State Elks Association currently employs three physical therapists who cover the State by plane or mobile units, supplying services for individuals for whom travel funds to treatment centers are not available.

State and local units of the American Cancer Society, the American Heart Association, and the National Mental Health Association are helping to defray costs of treatment and travel for patients as well as conducting educational activities. Local chapters of the American National Red Cross and the National Foundation are frequently called upon in times of emergency or disaster.

Professional organizations active in Alaska include the Alaska State Medical Association, the Alaska Nurses' Association, the Alaska Dental Society, the Alaska Society of Medical Technologists, the Alaska Hospital Association, and the Alaska chapter of the National Association of Social Workers.

Many villages have organized health councils which assist materially in promoting both routine and special health activities by providing voluntary services and by raising funds.

#### ***Health and Medical Services***

Medical care necessarily took precedence over preventive medicine in the early development of health services in Alaska. Medical care began with the Russian American Company, which engaged in fur trading, largely employing native workers. According to early reports, in 1866 the Russians were operating 4 hospitals, which admitted 14,550 patients during that year, "of whom only 34 died" (4). But for some years following the purchase of Alaska

from Russia the only medical care available was that provided by a few scattered missionaries or by military physicians attached to Army or Navy units assigned to Alaskan duty for intermittent periods.

Not until 1914 did the Federal Government establish an organized program of medical care for the Territory. This first program was under the auspices of the Bureau of Education. It was operated in conjunction with the first Territorial schools and provided treatment to natives only.

The first official step toward organization of Territorial public health activities was taken in 1913, when the first Territorial Legislature designated the Governor of Alaska to be commissioner of health. The Governor continued in this combined position until 1919, when the office of commissioner of health was created, with a physician appointed to the position on a part-time basis. The part-time commissioner and three part-time deputies constituted the entire health department until 1936, when funds became available through the Social Security Act for employment of a limited staff and establishment of a laboratory. Later, with Alaskan manpower assigned to theaters of war, and with many civilians discouraged into leaving Alaska by the Japanese landing on the Aleutians, lack of personnel reduced public health activity to emergency measures only. Since then, restoration of routine services and recruitment of personnel have been major problems.

In 1945, the Territorial Legislature gave the health department full legal status. It also established a Territorial board of health to act as an advisory body to the Alaska Department of Health, and provided for a commissioner of health on a full-time basis. The board of health was comprised of a representative of each of the four judicial divisions and the Governor.

In 1946, an extraordinary session of the legislature was called by the Governor to consider what could be done about the high rate of tuberculosis. The session resulted in the unanimous passage, by both houses, of a bill to pursue a comprehensive tuberculosis program, with an appropriation of a quarter of a million dollars. This sum was almost tripled by the next regular session of the legislature.

In the meantime, responsibility for medical

care for Alaskan natives, begun by the Bureau of Education, had been transferred in 1931 to the Office (later the Bureau) of Indian Affairs in the Department of the Interior. In July 1955, these services were assigned by Congress to the Public Health Service, Division of Indian Health.

In the years immediately following World War II, health activities of both the newly created department of health and the Alaska Native Service of the Bureau of Indian Affairs were devoted mainly to control of tuberculosis. The Territorial health department sought out active cases by chest X-ray surveys, while the Alaska Native Service tried vainly to find enough beds in its five small hospitals to isolate and treat all the active cases discovered.

From the outset, each health agency necessarily carried on a combined program of medical care and preventive services in order to meet immediate situations.

Gradually, treatment and prevention are being coordinated on an overall basis. Public health nursing services, for example, in outlying areas are currently being provided entirely by the Division of Health, Alaska Department of Health and Welfare, through contractual relations with the Division of Indian Health, Public Health Service. The itinerant public health nurses of the Division of Health carry out a generalized public health nursing program which includes therapeutic as well as preventive and educational functions. Nursing personnel coordinate their activities and work closely with personnel of the Division of Indian Health hospitals.

### *Health and Medical Personnel*

Theoretically, Alaska has 1 physician for every 1,700 persons in the population. Compared with the continental United States average of 1 physician per 800 persons, this ratio is low. The ratio of physicians serving the general population is even lower, because many physicians in Alaska occupy administrative positions or are assigned to serve only special groups, such as military personnel or Alaska Native Health Service beneficiaries.

Table 2 presents an approximate count of the physicians, nurses, and dentists currently work-

**Table 2. Medical, nursing, and dental personnel in Alaska, by type of employment, 1959-60 <sup>1</sup>**

Employer	Medical	Nursing		Dental
		Registered	Practical	
Public Health Service.	39	181	77	15
Alaska Department of Health and Welfare.	7	61	-----	-----
Private practice.....	117	667	124	54
Total.....	163	909	201	69

<sup>1</sup> Exclusive of military personnel. Data furnished by official agencies and State boards of medical, nursing, and dental examiners.

ing in Alaska, exclusive of those serving military personnel. Data on other health and paramedical personnel, such as medical social workers, laboratory and X-ray technicians, therapists, and so on, are less easily obtainable and counts fluctuate almost daily.

### Public Health Service

Of the 39 physicians employed by the Public Health Service, 14 are stationed in Anchorage either in the Division of Indian Health area office at Anchorage or on the Public Health Service hospital staff, and 10 are located at the Mount Edgecumbe field office and hospital near Sitka. Of the remaining 15 physicians, 10 are stationed at Public Health Service field hospitals, 2 at the Fish and Wildlife Service hospitals in the Pribilof Islands, 2 at the Arctic Health Research Center in Anchorage, and 1 at the Public Health Service outpatient clinic at St. Ann's Hospital in Juneau. Of the 10 Public Health Service physicians assigned to field hospitals, 4 are at Bethel, 2 each at Kotzebue and Tanana, and 1 each at Barrow and Kanakanak.

The 15 Public Health Service dental officers are scattered. Three are at Mount Edgecumbe hospital, three at Anchorage, and one each at Barrow, Bethel, Juneau, Kanakanak, Ketchikan, Kotzebue, Nome, the Pribilof Islands, and Tanana.

There are 79 registered and 43 practical nurses assigned to the Public Health Service hospital in Anchorage, and 60 registered and 34 practical nurses at Mount Edgecumbe. Nurs-

ing staffs of the field hospitals range from 23 at Bethel, 13 registered and 10 practical nurses, to 10, 6 registered and 4 practical, at Tanana. At present, five Public Health Service nurses are assigned to the Arctic Health Research Center. One is a nurse officer assigned to the AHRC staff in Anchorage, and four are stationed at Bethel, where they coordinate their field research activities with those of the Alaska Department of Health and Welfare nurses stationed in the area. Three other Public Health Service nurses are assigned to the staff of the Alaska Department of Health and Welfare and are regarded as State employees.

In addition to medical, dental, and nursing personnel, the Public Health Service employs a number of paramedical and other personnel such as are usually associated with hospital staffs and field health service programs. The Alaska Native Health Service also conducts a School of Practical Nursing at Mount Edgecumbe, the only school for nurse education, practical or professional, in Alaska. The school is fully accredited by the National League for Nursing. It provides 12 months of instruction and training and is open only to native residents between 17 and 45 years of age. Since its establishment in 1952, the school has graduated 149 students, of whom 38 are currently employed in the State.

Public Health Service personnel at the Arctic Health Research Center include, in addition to the two physicians and five nurses, research specialists in parasitology, biochemistry, physiology, entomology, and other fields related to public health, medical, and biological research.

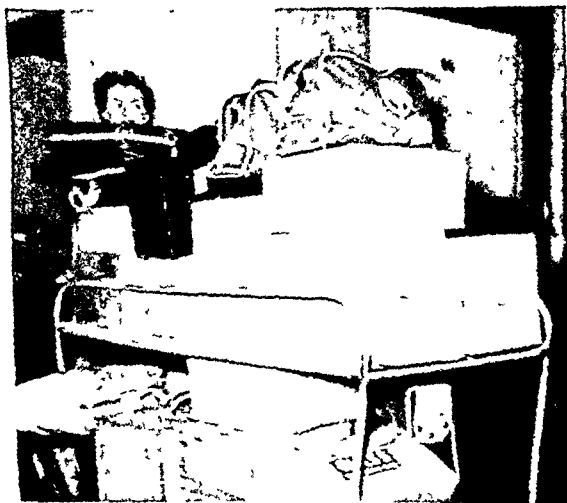
### Alaska Department of Health and Welfare

Personnel figures for the Alaska Department of Health and Welfare are tentative only, in view of current reorganization and changes in staffing. As of May 1960, there were five full-time and two part-time physicians in the Division of Health, and two full-time and one part-time physicians in the division of mental health. No dentists are currently employed by the Alaska Department of Health and Welfare.

The 61 nurses employed by the Alaska Division of Health include 8 in administrative positions, 28 assigned to urban or community



Public health nurse on her way to make a home call



Equipment required by itinerant public health nurse on field trips

programs, and 25 stationed in outlying areas on itinerant assignments. Each nurse assigned to an itinerant service visits from 2 to 20 villages on as regular a schedule as time, weather, and travel conditions will allow. Two psychiatric nurses have recently been added to the administrative staff of the division of mental health, bringing the total number of nursing positions in the Alaska Department of Health and Welfare to 63.

Sanitary engineers and sanitarians make up the largest group of professional health personnel, other than nurses, employed by the Division of Health. Activities of the 16 sanitary engineers, 6 sanitarians, and 30 part-time sanitation aides employed under contract with the Alaska Native Health Service are outlined in a later section dealing with environmental health. The staff of the Division of Health also includes medical social workers, laboratory personnel, health educators, statisticians, and others.

### Private Practitioners

Distribution of physicians and dentists in private practice and of private duty nurses in Alaska follows the usual pattern of urban concentration. Of the 117 physicians in private practice, for example, 49 are located in Anchorage and suburban Spenard, while of 42 dentists in private practice, 24 have their offices in the Anchorage area. Thus, about a third of the private medical practitioners and more than half the private dentists are concentrated in one area. Although the data on individuals in private practice in Juneau, Ketchikan, and Fairbanks are not available, table 3, which includes physicians, dentists, and nurses in government employment as well as in private practice, indicates the relative distribution of these personnel in urban areas.

Many of the physicians and dentists with urban headquarters have their own planes and frequently fly to outlying areas to provide service. A number of local specialists serve as consultants, on a contract basis, to the Alaska Native Health Service. They may provide consultation at the Anchorage or Mount Edgecumbe hospital or during special clinics scheduled at the five field hospitals.

**Table 3. Distribution of physicians, nurses, and dentists <sup>1</sup> in four principal Alaskan cities**

City	Population <sup>2</sup>	Physicians	Nurses	Dentists
Anchorage.....	82,560	65	262	25
Fairbanks.....	42,746	14	56	5
Juneau.....	8,594	8	45	6
Ketchikan.....	9,842	9	28	4
Entire State.....	223,888	163	1,127	54

<sup>1</sup> Includes both government employees and those in private practice, exclusive of military.

<sup>2</sup> Preliminary census figures released by U.S. Department of Commerce, May 1960.

In both government and private employment, the turnover of professional medical and health personnel is high. Recruiting for outlying areas is frequently handicapped by lack of adequate living quarters. However, this problem is gradually being overcome as funds become available or as individual communities assume the initiative in remedying the local situation.

### *Medical Social Services*

The medical social problems of Alaskan natives related to physical and mental illness are comparable to those which exist in other settings. In Alaska, however, they are intensified and complicated by economic, cultural, and geographic factors. Most villages are distant from medical centers, so when long-term hospitalization is necessary the patient, child or adult, is separated from the emotional and cultural support of family, friends, and community. Extended hospitalization or medical care are frequently complicated by situations such as the following: The ill spouse is replaced by another; children away from home forget their native tongue and upon their return home cannot communicate with their families; children adjust to different foods, environment, and family, if foster placement is made, and readjustment to native family, food, and home is often difficult. Because of the needs of other family members and the almost prohibitive cost of travel to and maintenance near the medical centers, parent or spouse is rarely able to accompany or to visit the patient.

With few trained social workers employed in Alaska's medical and welfare programs, and

with many individuals and families in need of assistance, direct and continuous casework help can be given to a limited number only. Many persons with a wide variety of backgrounds and experience, mainly the field hospital staffs and the itinerant public health nurses, are attempting to give help to people with complicated social problems.

The number of older people in Alaska is increasing, and resources such as nursing homes and chronic disease facilities are limited and not generally available to native patients. In Alaska, as elsewhere, there seems to be a diminishing desire and sense of responsibility on the part of families and communities to care for handicapped, chronically ill, and nonproductive adults unless financial assistance is assured. Few of the crowded native homes have the space or facilities to provide this care.

### *Health Status*

Although vital statistics for Alaska are incomplete, they still afford the best means of assessing current health conditions. Table 4 furnishes a comparison of death rates in Alaska and the United States as a whole for certain causes in 1950 and 1957 or 1958.

Because only crude, unadjusted rates are given for Alaska, the apparent low death rates from cancer, heart disease, and vascular lesions must be interpreted in light of the age distribution of the population. When age adjustments are made, the death rates, except for natives, are approximately equal to those of the 50 States.

Changes in infant and maternal death rates are generally regarded as significant measures of public health and medical progress. In Alaska, although health services are improving, the infant death rate among the native population in 1958 was still almost three times that for the United States (table 5). Among non-native Alaskans, most of whom have readier access to medical facilities, the 1958 infant death rate was slightly above that for the United States.

The apparent increase in the death rate due to diseases of early infancy shown in table 4 actually reflects only the high birth rates resulting from the large proportion of young adults of childbearing age in the population. The

Table 4. Comparative death rates<sup>1</sup> by important causes and race, Alaska, 1950 and 1958,<sup>2</sup> and United States, 1950 and 1957

Cause of death	Alaska						United States	
	All races		White		Native		1950	1957
	1950	1958	1950	1958	1950	1958		
All causes.....	926.3	610.3	666.7	509.2	1,693.2	1,036.8	963.8	959.0
Tuberculosis.....	174.5	12.0	15.8	5.4	654.9	39.5	22.5	7.8
Other infectious diseases.....	30.7	10.8	8.9	5.3	97.3	34.2	11.7	-----
Influenza and pneumonia.....	56.2	35.4	13.8	20.4	182.9	100.0	31.3	35.8
Other respiratory diseases.....	9.5	21.0	4.0	13.8	26.5	52.6	8.9	-----
Maternal.....	6.6	1.0	2.0	-----	20.6	5.3	2.0	1.0
Congenital malformations.....	10.2	21.0	6.9	20.4	17.7	26.3	12.2	12.8
Diseases of early infancy.....	44.5	76.4	34.6	61.2	76.7	139.5	40.5	39.1
Ill-defined.....	34.3	24.1	20.8	7.9	76.7	89.5	14.9	11.3
Accidents.....	153.3	115.9	132.5	100.0	218.3	181.6	60.6	56.0
Suicides.....	24.1	14.4	25.7	14.5	20.6	13.2	11.4	9.8
Homicides.....	12.4	10.3	10.9	7.9	8.8	15.8	5.3	4.5
Alcoholism.....	8.0	8.7	7.9	6.6	8.8	18.4	1.5	1.3
Cancer.....	65.7	49.2	72.2	48.0	44.2	57.9	139.8	148.7
Vascular lesions.....	47.4	33.3	53.4	31.6	29.5	39.5	104.0	110.2
Heart.....	167.2	113.8	193.9	120.4	82.6	92.1	355.5	369.1
All other causes.....	81.7	62.9	63.4	46.1	127.1	131.6	141.7	-----

<sup>1</sup> All rates per 100,000 estimated population.

<sup>2</sup> Data residence corrected.

SOURCE: U.S. data from National Office of Vital Statistics, Public Health Service. Alaska data from Bureau of Vital Statistics, Alaska Department of Health and Welfare.

rates given in table 5, showing deaths of infants under 1 year of age per 1,000 live births are a more realistic indicator of natal and postnatal conditions.

From these tables, it is evident that mortality rates in Alaska have improved in recent years. The greatest gain has occurred in control of communicable and infectious diseases, particularly tuberculosis.

Of major concern in Alaska is the increasing number of violent and accidental deaths (table 6). Alaskan death rates from accidents, homicides, and alcoholism are double those for the Nation as a whole. Despite improvement in the past few years, the rates remain high. For several years, accidents have been a leading cause of death among the native population (table 4).

The unusual reliance on air travel in Alaska plus the presence of several large air bases is one considerable factor in the high accident rate. Although the commercial and "bush" air-

Table 5. Infant and maternal death rates in Alaska, 1950, 1956, and 1958, and in the United States, 1950, 1956, and 1957, by race

Type of rate and year	Alaska			United States
	All races	White	Native	
Infant death rate: <sup>1</sup>				
1950.....	50.5	23.8	95.3	29.2
1956.....	41.2	25.3	88.7	26.0
1957.....	( <sup>2</sup> )	( <sup>2</sup> )	( <sup>2</sup> )	26.3
1958.....	39.0	27.9	70.0	( <sup>2</sup> )
Maternal death rate: <sup>3</sup>				
1950.....	24.3	8.7	50.9	8.3
1956.....	6.6	3.7	10.5	4.1
1957.....	( <sup>2</sup> )	( <sup>2</sup> )	( <sup>2</sup> )	4.1
1958.....	5.7	2.1	10.3	( <sup>2</sup> )

<sup>1</sup> Per 1,000 live births.

<sup>2</sup> Not available.

<sup>3</sup> Per 10,000 live births.

SOURCE: Alaska data from Bureau of Vital Statistics, Alaska Department of Health and Welfare; U.S. data from National Office of Vital Statistics, Public Health Service.

**Table 6. Deaths from selected accidental causes, for all races, Alaska, 1954-58**

Cause of accident	Number	Percent
All accidents-----	1, 299	100. 0
Transport accidents-----	661	50. 9
Railway, plus other road vehicles-----	2	. 2
Motor vehicle-----	169	13. 0
Water transport:		
Drowning-----	158	12. 2
Other-----	26	2. 0
Aircraft <sup>1</sup> -----	306	23. 5
Nontransport accidents-----	638	49. 1
Poisoning-----	39	3. 0
Falls-----	53	4. 1
Fire-----	115	8. 8
Firearms-----	55	4. 2
Drowning, nontransport-----	131	10. 1
Excessive cold-----	19	1. 5
Other-----	226	17. 4

<sup>1</sup> Predominantly military and noncommercial.

SOURCE: Bureau of Vital Statistics, Alaska Department of Health and Welfare, January 8, 1960.

line safety records in Alaska are excellent, accidents involving planes operated for the sole use of the owner have boosted the mortality rate from transportation accidents to top position. Rates for deaths from drowning and from fires are also high, especially among the native population. Even the number of deaths from motor vehicle accidents is relatively high in Alaska in spite of its limited highways.

Assessing Alaska's morbidity rates is risky. Information available on incidence of communicable and other diseases is incomplete and often inaccurate, and can be misleading. While it can be stated with some accuracy that there have been no recent decimating epidemics of childhood diseases among the native population, such as have occurred in past years, the true incidence of disease is unknown. Most of the difficulty in obtaining accurate information on morbidity stems from the lack of medical facilities and personnel. Cases of disease in outlying villages may be missed entirely or may be inaccurately reported by untrained observers.

The situation is gradually improving as better communications are established and as funds become available for assigning trained personnel to the field. Education has also played a major role in improving the reporting of disease outbreaks and in obtaining prompt

medical attention when needed. Village teachers and missionaries have effectively supplemented the efforts of health personnel in helping villagers to learn about and to accept sanitation and other health practices.

A continuing handicap to accurate diagnosis and reporting of disease in remote areas is the difficulty of obtaining laboratory specimens for confirmation within a reasonable time after the onset of illness.

Diagnostic laboratories, other than those located in the major population centers, are few and far between. The process of collecting and delivering specimens to the laboratory is complicated by travel delays which may cause cultures to die or to freeze en route. The cost of laboratory services is not inconsiderable in Alaska. In 1958 the average cost of these services in the Alaska Division of Health laboratories was \$1.47 per specimen, or 52.6 cents per capita, about three times greater than in many smaller, more densely populated States.

### Tuberculosis

Tuberculosis has been Alaska's number one health problem for well over a century, according to historical reports. There is no evidence that tuberculosis existed among Alaskan natives prior to the arrival of the white man, but once introduced, the disease apparently spread rapidly. The first reference to the occurrence of tuberculosis among the native peoples of Alaska, according to Aronson (5), appeared in 1770, some 29 years after the discovery of Alaska. But by 1814, tuberculosis was reported as one of the most common diseases among the natives. From that time on references to the large numbers of cases of and deaths from tuberculosis are frequent.

A 5-year study of the causes of death in Alaska, 1926-30, revealed that the tuberculosis death rate among Alaskan natives during that period was 655 per 100,000 population (6). The very first issue of *Alaska's Health* (7) the official publication of the Division of Health, contains the following statements:

"... tuberculosis is 10 times as prevalent in Alaska as in the northern States and far surpasses all our communicable disease problems together as a direct cause of death."

"... tuberculosis is causing more servicemen

to be sent back to the States from Alaska than from any other outpost of the war."

"Large numbers of natives are unsuited to military service because of tuberculosis."

"Nearly 90 percent of routine X-rays among natives in the Arctic indicate the presence of tuberculosis."

In 1950, the tuberculosis death rate among Alaskan Eskimos and Indians was still an appalling 654.9 per 100,000. But between 1950 and 1957 a remarkable change occurred, and by 1957 the tuberculosis mortality rate among natives had been reduced to 116.2 per 100,000 (table 7). Provisional rates for 1959 show a further reduction to 53.8 per 100,000 in the native population.

The story behind this dramatic reduction in tuberculosis deaths began in 1946, during a special session of the Territorial Legislature, called by the Governor at the behest of the Territorial department of health and the board of health. There were, at the time, 4,000 known active cases of tuberculosis in Alaska, with about 75 hospital beds available for tuberculosis patients in the entire Territory.

Beginning with this special session, in the next few years Alaska's Legislature appropriated more funds per capita for tuberculosis control than any State legislature in the Nation. These Territorial funds, plus generous contributions of Federal funds made available by Congress beginning in 1948, accelerated control

of tuberculosis within the next decade to the point where Alaska can now care for all its tuberculosis patients within its own borders. This in itself has been a major achievement.

In spite of the tremendous gains in the past 14 years, tuberculosis is still a major health problem demanding continued effort and vigilance. During 1959, there were 356 newly reported active and probably active cases, representing a rate of 178.0 cases per 100,000 total population. As in past years, the preponderance of cases (766.6 per 100,000) was found in the native population (8).

Although the methods employed in the 1950-57 Alaska campaign against tuberculosis were the same procedures used elsewhere, that is, casefinding, hospitalization, chemotherapy, rehabilitation, education, and followup, their application in Alaska demanded drastic modification and ingenuity.

Generally in the 48 States, the highest incidence of tuberculosis has been found in urban areas. In Alaska, the highest incidence occurs in the small Eskimo, Indian, and Aleut villages, particularly those located in the Kuskokwim and Yukon River deltas. As in urban slum areas in continental United States, the economic status in these villages is marginal, many of the homes are crowded and poorly ventilated, and most of them lack sanitary facilities. Nutrition is poor and resistance to disease is generally low.

Table 7. Tuberculosis deaths, all forms, and death rates,<sup>1</sup> by race, Alaska, 1950-59

Year	Total		White <sup>2</sup>		Native <sup>2</sup>	
	Number	Rate	Number	Rate	Number	Rate
1950.....	239	174.5	16	15.8	222	654.9
1951.....	239	148.4	13	10.5	223	655.9
1952.....	191	100.0	19	12.4	171	500.7
1953.....	130	63.4	10	6.0	120	349.8
1954.....	97	46.7	14	8.3	82	236.6
1955.....	54	25.8	8	4.7	45	128.6
1956.....	50	24.3	9	5.5	41	114.0
1957.....	56	26.5	13	7.7	43	116.2
1958.....	23	12.0	8	5.4	15	39.5
1959 <sup>3</sup> .....	24	12.0	3	1.9	21	53.8

<sup>1</sup> Per 100,000 population.

<sup>2</sup> Figures for whites and natives do not necessarily add to total, which may include certain other races not shown in detail here.

<sup>3</sup> Provisional figures.

SOURCE: Alaska Department of Health and Welfare.





Village of Atka far out toward the tip of the Aleutian Islands Chain (beyond area shown on map)

Tuberculosis casefinding in the early days of the Alaskan campaign was limited to the field hospitals and a single Territorial department of health mobile X-ray unit which traveled from village to village by whatever mode of transportation was available, as time, weather, and funds permitted. Developing the exposed film often had to be delayed for weeks until the technician reached a hospital equipped for film processing. In early 1945, a motorship, the *Hygiene*, was put into operation as a floating X-ray and clinic unit, visiting communities along the southeastern coast.

When the organized campaign against tuberculosis was begun, official and voluntary agencies combined their resources to put additional X-ray facilities into operation. Two additional marine units were equipped to extend health services to northern coastal and inland river villages. A railroad car, furnished by the Alaska Railroad, was outfitted to serve railbelt communities, and a motor truck unit was provided for surveying communities along the Alaska Highway and the limited access roads.

Airborne units were also used to reach the many communities accessible only by air.

As air travel improved, the various mobile surface units were gradually withdrawn from service, and from 1957 on, most of the X-ray activities have been performed by three airborne units. Each unit is equipped with a portable X-ray machine, darkroom tent, and gasoline generator, and each is manned by a technician. Two of the units are supported by the Public Health Service Division of Indian Health, the third by the Alaska Division of Health.

Of 37,695 chest X-rays taken in 1959, almost two-thirds were taken by the three airborne units. The remaining X-rays were taken by health centers, Alaska Native Health Service hospitals, general hospitals, the U.S. Coast Guard, and the Alaska National Guard.

Laboratory work relating to tuberculosis control constitutes a major item in the work schedules of the four Alaska Division of Health laboratories. During 1959, a total of 22,868 tuberculosis smears and cultures were processed in

the four laboratories. Over 15,000 individuals were tuberculin tested in 1959 in connection with casefinding or followup activities, the majority on request of physicians.

Facilities in Alaska are adequate today for treating all tuberculosis cases requiring hospitalization. The 75 tuberculosis beds available in 1946 had been increased by 1953 to 796, chiefly by the opening of the Alaska Native Service hospitals at Mount Edgecumbe and Anchorage. Even with this tenfold increase, however, the number of available beds still fell far short of meeting the need.

In 1955, additional beds were made available on a contract basis at hospitals and sanatoriums in the State of Washington. On December 31, 1955, the total number of Alaskan patients hospitalized for tuberculosis within and outside Alaska was 1,311. By December 31, 1958, the number had dropped to 441, all hospitalized within Alaska. This drop represents a significant gain, inasmuch as by 1958 the requirements for hospital admission had been considerably relaxed, and patients who would not have been considered in 1955 were now being admitted.

Only 6 years ago, the waiting period for tuberculosis hospitalization often defeated the casefinding program. Take the hypothetical, but typical, case of Wassillie Niptuk, 40-year-old Eskimo from Iliamna. Wassillie received his chest X-ray in August 1954. When the film was developed and read a month later, the need for hospitalization was indicated. His name was put on the priority board list in January 1955, but a hospital bed did not become available until October of that year. When the hospital tried to contact Wassillie to arrange for hospitalization, the public health nurse reported Wassillie had died the previous week.

Public health and medical personnel in Alaska are particularly proud of the fact that few Alaskan tuberculosis patients leave the hospital against medical advice. Of 480 hospital discharges in 1959, only 12 were against medical advice. In the 48 States, more than 30 percent of the annual discharges have usually been against medical advice (9).

Late in 1954, when many tuberculosis patients had to wait months for hospitalization, a home

treatment program based on the use of drugs and antibiotics was initiated among native patients in their home villages. The initial objective of the ambulatory chemotherapy program was to determine whether a scheme of administering isoniazid (INH) and para-aminosalicylic acid (PAS) on an ambulatory basis over a long time with, at best, only intermittent supervision was a practicable procedure in Alaska. The program, financially supported by the Public Health Service, was inaugurated in December 1954 under the direction of the Arctic Health Research Center in cooperation with the Territorial department of health and the Alaska Native Service.

During the next 1½ years, the chemotherapy program was extended to 70 native villages in northern, western, interior, and south-central Alaska, where tuberculosis was especially prevalent. By mid-1956, when some 1,600 patients were participating, the program had been widely accepted and was deemed practical and became a continuing phase of the treatment for tuberculosis. In September 1956, the Territorial health department assumed responsibility for continuing chemotherapy in native villages in all of Alaska save the Bethel area where the Arctic Health Research Center retained responsibility for the program.

Patients were started on chemotherapy on recommendation by physician members of a priority board, primarily on the basis of X-ray evidence or positive sputum reports, or both. In general, tuberculosis patients who were started on chemotherapy included those awaiting hospitalization, those returning from the hospital, and patients who, because of shortage of hospital beds, could not be admitted at the time hospitalization was recommended.

Recommendations of the priority board were given to medical officers in the Alaska Native Health Service field hospitals, who issued orders for therapy to teams of field nurses. The nurses were directly responsible for bringing the program to the villagers, eliciting cooperation of patients, supervising administration of the drugs, explaining the program, and evaluating the response. In each village, the nurse was assisted by a native chemotherapy aide, usually selected by the village council for training by the nurse.

The success of the chemotherapy program testifies to the effectiveness of the concerted efforts of all individuals and agencies concerned. Of particular importance were the close working relationships which developed among governmental agencies; the cooperation and assistance given by the village teachers; the willing participation and cooperation of the Eskimos and Indians, who were only too well aware of the specter of tuberculosis; and above all, the dedicated efforts of the nurses, who were directly responsible for explaining the program and insuring its acceptance.

The precise contribution of the ambulatory chemotherapy program to the tuberculosis control program cannot be determined. There is little question, however, that initiation of home treatment during the period of waiting for hospitalization, together with drug therapy during hospitalization, radically shortened the length of stay in the hospital, thus making beds available to more patients.

In the Bethel area, the number of village patients on home treatment fell from nearly 1,100 persons, 18 percent of the population in participating villages, in September 1956, to 400 persons at the end of 1958. By 1957, the characteristics of the population on home treatment had shifted completely. Instead of a preponderance of patients awaiting hospitalization, the majority were posthospital cases. The tide of tuberculosis had turned.

Even while the need for effective treatment still seemed desperate, hopes were raised for a means of preventing tuberculosis infection. A tightly controlled study of the effectiveness of INH in tuberculosis prevention was initiated in southwestern Alaska late in 1957 by the Public Health Service Tuberculosis Program and the Arctic Health Research Center in conjunction with the Alaska Native Health Service. Some 5,000 persons, 80 percent of the total population, in 24 villages were put on daily medication for 1 year. Although results of this study will not be known for several years, it is anticipated that this trial, in combination with other trials in the rest of the country, will demonstrate whether or not the administration of isoniazid will prevent the development of tuberculosis or the relapse of tuberculosis patients.

## Other Diseases

For lack of data on diseases other than tuberculosis in Alaska, estimates of current morbidity are, of necessity, based largely on clinical observation, supplemented by a few morbidity studies.

For many years the Alaska Division of Health has compiled reports of notifiable diseases from data submitted by the health centers in the larger communities, weekly laboratory reports, and intermittent postal card reports from individual physicians. According to a 20-year summary based on these reports, the "top 10" diseases in order of numbers of cases reported were: influenza and pneumonia, measles (including German measles), tuberculosis, chickenpox, gonorrhea, mumps, impetigo, syphilis, streptococcal sore throat, and whooping cough.

A limited morbidity study conducted in the Anchorage area in 1952 indicated that the pattern of illness in that area differed little from that found in cities of similar size in continental United States. Respiratory illnesses led the list in both instances but with fewer days of disability in Anchorage than elsewhere. Detailed morbidity studies are currently underway in the field.

Early attempts to assess morbidity by hospital admissions throughout Alaska met with little success, because of the lack of medical records. In many instances, the admitting physician was frequently the only individual who knew why the patient was in the hospital. In the early years, records from the Alaska Native Service hospitals invariably listed tuberculosis as the sole reason for hospitalization.

As indicated earlier, the data on death rates from heart disease, cancer, and other diseases associated with aging are misleading because of Alaska's predominantly young population. A study of heart disease among Alaskan Eskimos and Indians is now underway, and results of this study may alter the general impression that native groups are not subject to the same stresses and strains as the white population.

Progress toward control of communicable disease in Alaska is uneven. The problems of the larger communities are essentially the same as those found in all urban areas where pop-

ulation growth outstrips the planning and development of adequate sanitary facilities and health services. In view of the frontier character of even the larger Alaskan cities, it is remarkable that there have been no major outbreaks of communicable disease. As for the villages, although epidemics of mumps, measles, and other so-called childhood diseases occur from time to time, their effects are far less devastating than in former years, thanks to the vigorous immunization and education programs carried on by the Alaska Division of Health and the hospitals of the Public Health Service Division of Indian Health. Improvements in home and village sanitation, slow as they are, are real. Many tuberculosis patients returning to their villages from the hospital have contributed to these improvements by encouraging other ill persons to seek treatment and by demonstrating improved housekeeping and personal practices learned in the hospital.

Enteric infections are known to be common in Alaska, particularly rural Alaska, although their incidence is not on record. Itinerant public health nurses and individual investigators report that enteric upsets occur so frequently in villages that they are regarded by the people as normal events and are seldom reported. Those upsets which are reported are rarely confirmed by laboratory or clinical methods, for reasons cited earlier.

Field and laboratory studies have turned up relatively few bacterial pathogens in connection with outbreaks of enteric disease. Only 625 cases of salmonellosis, paratyphoid fever, and typhoid fever were reported in Alaska between 1937 and 1957. During the same period, 576 cases of enteric disease were reported as gastroenteritis and 692 as diarrheal infections. *Salmonella typhimurium*, *Salmonella typhosa*, *Shigella flexneri*, and *Shigella sonnei* are the species most often isolated in the laboratory.

The incidence of enteric infection is higher in summer than in winter, increases with the spring breakup, and continues sporadically until freezeup. Although the exact modes of transmission of organisms are not known, the number of long-drawn-out household epidemics implicates poor food handling, contaminated water supply, and overcrowded dwellings. Indirect transmission of infection through con-

tamination of the surroundings by dogs, which abound in each village, has been demonstrated for *Salmonella typhosa*. Intensive short-term studies of intestinal parasitism have shown a high prevalence in some areas of parasitic infestation, notably fish tapeworm. A 30 percent infection rate has been reported in single villages (10).

Blood sugar determinations performed on 1,227 Eskimos, plus review of clinical records of Alaska Native Health Service hospitals and available vital statistics reports, have uncovered only 3 confirmed and 2 doubtful cases of diabetes mellitus among the 16,000 Eskimos living in Alaska (11). Although age distribution and lack of diagnostic facilities no doubt account in part for the infrequency of diabetes, nutrition and racial characteristics may be factors. Possibly an increase in the number of cases of diabetes may be expected as the transition from native to imported foods continues.

A moderate form of anemia has been found to occur in Eskimos over much of Alaska (12). Results of detailed investigations and experimental studies of the effects of iron therapy suggest that iron deficiency and some other factor, as yet undetermined, are associated with the condition. Also, dietary studies and clinical observations indicate that iron intake among Eskimos is below allowances recommended by the National Research Council. The possibility that low hemoglobin levels might be associated with fish tapeworm infestation was investigated, but no apparent relationship could be demonstrated.

Corneal scarring with resultant loss of visual acuity has long been considered a major affliction of Eskimos and Indians. Various causes for this eye condition have been explored by investigators in past years, but no completely satisfactory explanation has been established. Tuberculosis, nutritional deficiencies, snow blindness, and indifferent personal hygiene have all been suggested. Tuberculosis is generally given most of the blame, although it is not invariably associated with phlyctenular keratoconjunctivitis (PKC).

A preliminary survey to determine prevalence of corneal scarring, the first step in an epidemiological study of PKC, showed that 41 percent of 6,000 persons examined had corneal

scars, with varying degrees of visual impairment.

Animal-borne diseases, such as trichinosis, rabies, and echinococcosis or hydatid disease, are known to occur in Alaska in somewhat different patterns than are found elsewhere. For example, trichinosis occurs in walrus, in black, grizzly, and polar bears, and in a number of other flesh-eating animals on which the natives depend for meat. In one survey, 27 percent of the residents of one coastal village showed positive reaction to skin tests for trichinosis. As pork production is extremely limited in Alaska, most human cases of trichinosis here are attributed to undercooked bear meat.

Rabies is endemic among wild animals in Alaska, and it is generally believed that the large fox population serves as a reservoir for the disease. Despite frequent reports of dog bites, only three clinical cases of human rabies have been reported. None was confirmed by laboratory examination. In view of the large dog population in Alaska and the close association of these animals with villagers, the low case rate of human rabies is puzzling. Three possible explanations have been advanced: (a) that the dog team owner, thoroughly familiar with the behavior of rabid foxes, wolves, and dogs, is quick to destroy any animals exhibiting typical symptoms; (b) that the heavy fur, wool, and skin clothing worn by both children and adults provides effective protection against bites; and (c) that the type of rabies endemic in Alaska is less virulent than the types found elsewhere. Special studies of the last theory are underway.

A number of cases of the cystic form of hydatid disease, caused by *Echinococcus granulosus*, have been found in Alaska since this form of the disease was first recognized in 1948. Surgical removal of the cysts, which are usually found in the lungs, has been accomplished with good prognosis.

The occurrence of a second form of echinococcosis in Alaska was first recognized in 1952 in the course of investigations underway at the Arctic Health Research Center. This second or alveolar form of hydatid disease, caused by *Echinococcus multilocularis*, presents a much more serious aspect than cystic echinococcosis. Nine human cases of this form of the disease

have been discovered in Alaska in the last few years. The liver is the most common site of this infection, and early diagnosis is extremely difficult. Generally, by the time the disease is recognizable in man it is inoperable.

Alaskan investigators are working in close collaboration with laboratories in other parts of the United States and with European investigators in an attempt to find effective diagnostic methods which will permit earlier detection and treatment of alveolar hydatid disease. The life cycle of *E. multilocularis* in Alaska has been found to include voles and arctic foxes. Dogs frequently become involved and man becomes infected accidentally. The infection is transmitted by fecal contamination, but the exact details of transmission are not known.

### Dental Health

The general impression has been that Alaskans, as a group, have poor teeth. Examinations of Eskimo and Indian patients at Public Health Service hospitals and during infrequent field visits have confirmed this impression. Little information is available concerning the dental health of the white adult civilian population, aside from the fact that dentists in private practice in Alaska are extremely busy.

According to two 1955 dental surveys conducted by the Public Health Service, school-age children in the Anchorage area showed a lower rate of tooth decay than did children in the same age groups in Tacoma, Wash. By contrast, 1952 statistical estimates of the amount of tooth decay among Eskimo children at Barrow and among Indian children at Ketchikan indicated the highest decay rates reported anywhere in the United States and its possessions. Observers also find that the more isolated the village, the smaller the number of decayed teeth. In such villages there tends to be a high proportion of protein and fat in the diet and relatively little carbohydrate.

Expansion of Public Health Service dental health services among Eskimo and Indian residents has presumably reduced the backlog of acute dental needs to some extent, but the field of preventive dentistry has hardly been touched.



Eskimo woman sewing on parka. Eskimo women are artists at skin and fur sewing and make boots (mukluks) and parkas for themselves and their families. Use of their teeth in "crimping" the mukluk soles can lead to a dental problem.

At the present time, Anchorage is the only Alaskan community fluoridating its water supply; however, this particular supply serves only about one-fourth of the total population of the Anchorage area. Since the majority of Alaska's population is still dependent on individual wells or other private sources of supply, the benefits of fluoridation are not likely to be made available on a large scale for some time.

Questionnaires on the subject of health services distributed to village chiefs and officials brought the following replies (13): "No dentist

ever been here." "No dentist stop here for 10 years." "When dentist comes only has time for extractions."

The dental care situation among non-native civilians living outside the few metropolitan areas has not improved. Of the 54 dentists in Alaska, 40 are located in the 4 largest cities. Emergency patients from outlying communities must travel to the nearest urban area, hoping that one of the dentists will squeeze him in on his crowded schedule. All too often the patient discovers that multiple treatments are needed, and his dental bill is increased by the expense of board and room and travel.

### Maternal and Child Health

For many years, health services for children in Alaska were overwhelmed by the number of acute orthopedic deformities caused by tuberculosis of bones and joints. Shortly after the orthopedic section of the Mount Edgecumbe hospital opened in 1946, it was believed to have more patients with bone tuberculosis under its roof than any other one spot in North America. As recently as 1955, bone tuberculosis was found frequently among Eskimo and Indian children by traveling orthopedic clinics during annual circuits. Happily, progress in control of extrapulmonary as well as pulmonary tuberculosis has been such that bone tuberculosis today is almost as rare in Alaska as in other States.

At present, upper respiratory infection is responsible for more disability in Alaskan children than any other single disease entity. Chronically draining ears and chronic mastoiditis, with varying degrees of hearing loss, are highly prevalent. Estimates based on surveys by competent otologists indicate that as many as 3,000 children in Alaska require radical mastoidectomies before their chronic infections can be cleared up.

The number of children requiring extensive surgical treatment and the expense of transporting patients for treatment have spurred attempts to find means of reducing complications from respiratory disease. A special study was undertaken in 1957-58 to see if an intensive program of prevention would be effective. Six villages along the lower Yukon and lower Kus-

kokwim Rivers in western Alaska were known to have exceptionally high rates of chronic ear, nose, and throat infections. A team consisting of a physician, two public health nurses, and a health educator was sent to these villages by the Alaska Division of Health. The health educator was assigned to study the attitudes of the villagers and, if possible, find ways of encouraging them to improve health practices. The two nurses supported the medical and educational services by following up special cases through home visits. Consultation services were available from personnel of the Division of Health and other agencies. Nose, throat, and other specimens were collected periodically and forwarded to the Epidemiology Section of the Arctic Health Research Center for culture and study. The accumulated laboratory findings and field data are now being analyzed.

More than 1,500 handicapped or injured Alaskan children received diagnosis, treatment, or hospitalization through the Division of Health during 1959. Under the program operated by the crippled children's services section of the Division of Health and financed by State and Federal funds, services are provided for orthopedic, plastic, eye, ear, nose, and throat, and chronic disease cases.

A total of 1,518 children received diagnosis or treatment for 41 different crippling conditions (14), including the following:

<i>Condition</i>	<i>Cases</i>
Tuberculosis of bones and joints.....	76
Aftereffects of poliomyelitis.....	43
Cerebral palsy.....	35
Eye conditions (ranging from simple corrections to surgery).....	411
Deafness and hearing impairment.....	146
Heart conditions, including heart surgery.....	135
Congenital malformations.....	226
Severe burn cases, requiring long hospitalization and care.....	6

During the year 128 children were hospitalized a total of 1,074 days, or the equivalent of nearly 3 years. Children requiring complicated treatment for such conditions as cleft lip and palate and for severe burns are sent to Seattle for treatment. Children with congenital heart disease are sent to San Francisco for specialized diagnostic workups and for heart surgery, including the new open heart surgery.

Transportation costs constitute a large item in the child health program. Between July 1 and December 31, 1958, for example, transportation costs accounted for 20 percent of the total cost of the services provided.

This financial strain has been eased materially by the Alaska Native Health Service and by voluntary groups, notably the Alaska Crippled Children's Association and the Alaska Tuberculosis Association. State, Federal, and voluntary agencies have also cooperated in bringing specialists to Alaska for diagnostic clinics, consultation, and training sessions.

## Mental Health

Responsibility for management of its own mental health problems was transferred to Alaska from the Department of the Interior as recently as 1956. In passing the Alaska Mental Health Act that year, Congress also gave Alaska the right to select 1 million acres of public lands within its borders to be used as a source of income for support of mental health services.

Hospitalization for most of Alaska's mental patients is still provided through contractual arrangements with Morningside Hospital, a private institution in Portland, Oreg., as it was under the Department of the Interior. Total cost of the Morningside program in 1958 amounted to \$1,100,000, including \$44,000 for transportation of patients and escorts. Seventy-nine Alaskan patients were admitted to Morningside Hospital during 1958, with a total of 404 Alaskan patients on the hospital records as of December 31, 1958.

The diagnostic classification of the 79 patients admitted to Morningside during 1958 was:

<i>Diagnosis</i>	<i>Percent</i>
Psychotic disorders.....	45.5
Chronic brain syndrome.....	21.5
Mental deficiency.....	17.5
Psychoneurotic disorders.....	7.5
Personality disorders.....	3.7
Transient situational disorders.....	1.3
Undiagnosed.....	3.0

Alaska has begun to develop an integrated program of mental health activities, including diagnostic, preventive, and educational services. Under the direction of the division of mental health of the State department of health

and welfare, studies have been made of Alaskan patients admitted to Morningside Hospital during recent years to determine their distribution by age, sex, and race as well as by diagnosis.

One of the most significant findings is the marked increase between 1948 and 1958 in the number of admissions among patients in the younger age groups. Comparison of data on admissions for the two 5-year periods, 1949-53 and 1954-58, shows a 68 percent increase in the admission of patients under 6 years of age during the period 1954-58 and a 46 percent increase among the 6- to 10-year-olds during the same period. These increases may be attributable in part to the practice of sending mental defectives to Morningside for lack of any alternative facility in Alaska. However, a significant proportion of the increase is undoubtedly due to disturbances among young people which presumably might have been detected earlier and treated locally had community facilities been available.

During 1958, mental health outpatient clinics were provided for southeastern Alaska through the Juneau office, and for the south-central region through the Anchorage office. Thus far, only consultative services have been possible for the northern region. Personnel of the mental health division travel as teams to communities outside the urban areas. In the 12 months ending June 30, 1958, the clinic personnel and traveling teams saw 419 patients and conducted 1,527 interviews.

Of the 419 outpatients seen, 233 were male, 186 were female; 270 were under 18 years of age and 149 were over 18. Patient referrals came from the Alaska Native Health Service, the Alaska Department of Health (for the most part from public health nurses), the Office of Vocational Rehabilitation, public schools, police officials, Federal courts, U.S. commissioners, the Alaska Department of Welfare bureau of juvenile institutions, private physicians, and other sources.

Since 1957, voluntary admission to Morningside Hospital has been permissible and jury trials are no longer required, although the protection of a court hearing has been retained for those who desire it. In 1958, of the 79 admissions, 39 were voluntary, 22 were judicial, and 13, certified by a physician, were involuntary.

The remaining five included one transfer and four patients returned from convalescent leaves.

Of the cases closed during 1957, nearly half bore the notation "further care indicated," but the needed clinic services or community resources were not available.

### *Environmental Health*

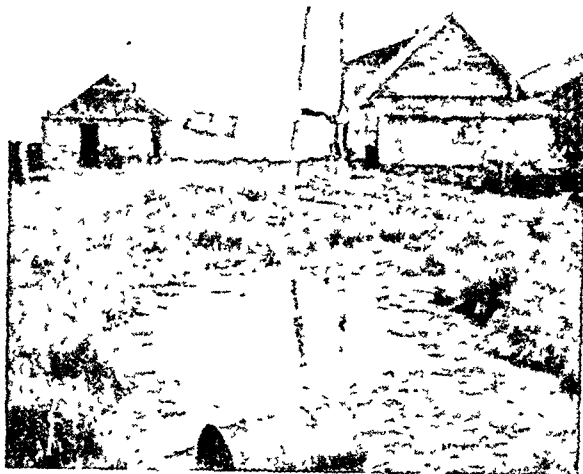
Alaska's environmental health needs include both the familiar and the unique. In Ketchikan, Juneau, Anchorage, and other urban communities located in the more temperate southern and central portions of Alaska, the tasks confronting the sanitary engineer do not differ markedly from those found in many cities of comparable size in continental United States. On the west coast and in interior and northern Alaska, the tasks are complicated by permafrost, extremes of temperature, and the character of the small, widely dispersed communities.

Throughout Alaska, unique political, economic, and social structures require "custom tailoring" of services, which tax the ingenuity of environmental health personnel. Only in the north is a sanitary engineer called upon to collaborate in developing a manual for the handling and tethering of sled dogs or to demonstrate how to drill a well through several hundred feet of permafrost.

Sanitation services in Alaska are currently provided for both the State as a whole and for more than 300 individual communities by a staff of 22 engineers and sanitarians in the department of health and welfare; by a lone sanitary engineer in the area office of the Alaska Native Health Service; and by 30 part-time sanitation aides who are employed through contractual arrangements between the State Division of Health and the Alaska Native Health Service.

The professional staff of the Division of Health carries on educational, consultative, supervisory, and inspection services and administers statewide programs involving industrial health, water pollution control, radiological health, and safeguarding of foods, drugs, and cosmetics. The Alaska Native Health Service sanitary engineer is charged with the responsibility of inspecting sanitary facilities at all the Public Health Service hospitals and at Bureau of Indian Affairs boarding and day schools throughout Alaska.





Waste disposal beside frame house

In the outlying villages, the efforts of the staffs of the two official agencies are reinforced by part-time Eskimo and Indian sanitation aides. The aides, selected by joint agreement of the village council and health agency representatives, receive brief but intensive training in basic sanitation through courses planned and administered by the Division of Health in consultation with personnel of the Alaska Department of Health and Welfare, Alaska Native Health Service, and Arctic Health Research Center. Activities of the aides in their assigned villages are supervised and reviewed periodically by the same agencies.

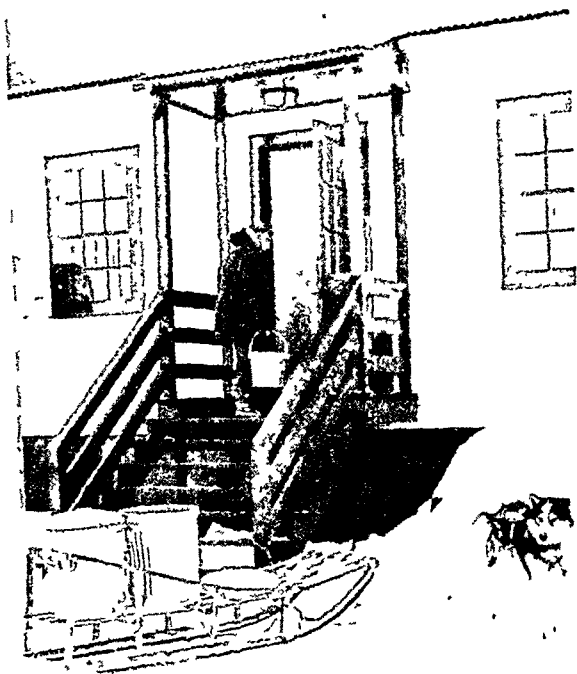
Adaptation of water supply, waste disposal, housing, and food-handling methods to Alaskan needs requires careful observation and research. As temperature drops, operation and effectiveness of many of the standard sanitation devices and practices are impaired unless countermeasures are applied. Chemical and biological reactions are generally retarded at low temperatures, and the physical properties of materials are often changed.

The Alaska Division of Health cooperates closely with designing engineers, architects, public agencies, the Arctic Health Research Center, and other groups in developing and promoting needed modifications of standard devices. A recirculating water system installed at Fairbanks, largely as the result of the joint effort of the Alaska Division of Health and the Arctic Health Research Center, has been called the most ingenious water system in North

America. The farthest north sewage stabilization pond, now in operation at Fort Yukon, is another example of such a joint effort by these two agencies. Basic data on coastal and inland waters and their ability to assimilate wastes are also being accumulated. Experimental closed-circuit toilet units have been installed at various locations through interagency cooperation. These are being observed as a possible waste disposal method for isolated dwellings and small settlements where conventional systems are impractical because of extremes of temperature, scarcity of water, or presence of permafrost, separately or in combination. Coordination of planning and joint financing of projects among the three official health agencies is slowly but surely paying dividends in improvements in community sanitation.

Many of Alaska's environmental sanitation problems could be solved were adequate money available. Per capita incomes in the small communities are invariably too low to finance utilities even of the most simple variety. The Indian Sanitation Facilities Bill, which became Public Law 86-121 in July 1959, offers some assistance to the small native villages in developing community water supplies and in improving home and village waste disposal facilities through cooperative projects. The number of requests for such projects already received testifies to the great interest in the program. Many villagers have indicated their awareness of need for improvements and their eagerness and willingness to contribute local materials and labor as their share in the projects.

Education and demonstration play an essential part in village improvements. Without community acceptance and understanding of sanitary methods and facilities, improvements are worthless. Constant supervision in each community is obviously impossible in an itinerant program, where even the part-time sanitation aide may be given responsibility for more than one village. Emphasis is placed therefore on the need for careful explanations, which must often be given through an interpreter, to develop complete understanding within limits of the educational levels of the residents. Evidence of the achievement in education is seen in changed practices and atti-

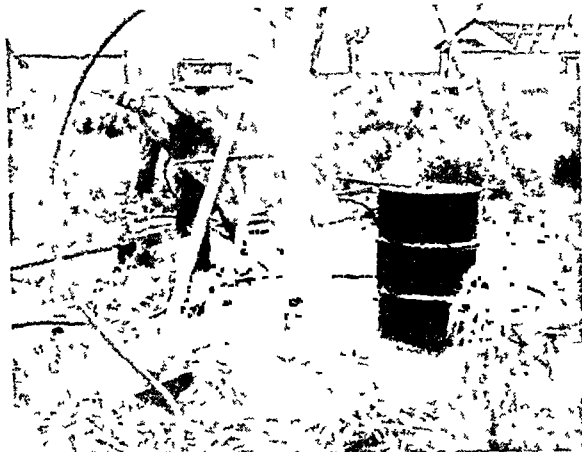


Water supply is a problem in the Arctic. Cans are used to dip water through holes in the ice on lakes or rivers. Sanitaricians and public health nurses stress boiling or chlorine treatment of water for household use.

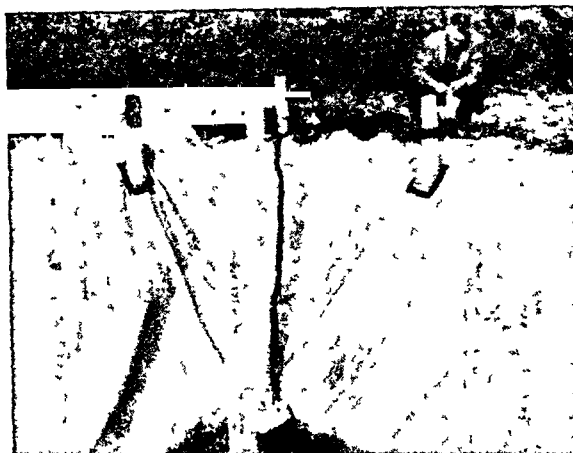
tudes observed among residents in the various villages and in the increasing number of requests for advice and assistance received by all health agencies.

### Housing

Health and population gains in native villages and rising standards of living are intensifying demands for better housing in many communities. Experimental houses, based on designs specifically adapted to climatic conditions which exist in different parts of Alaska, have been constructed in several villages as demonstration units. A scale model of each experimental unit was built and taken to the village so that local residents could follow construction details and participate in the building program. As each unit is completed, a local family, selected jointly by the village council and health agency representatives, occupies the dwelling rent free for a trial period, during



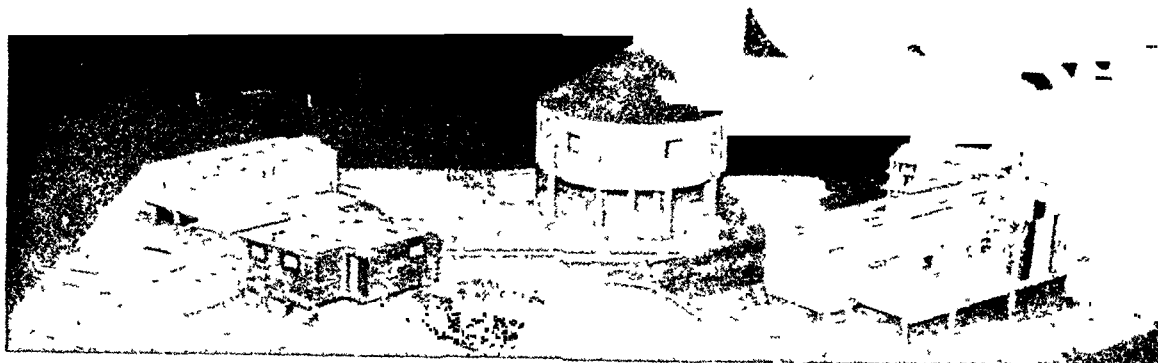
Well jetting through permafrost, Eek



Experimental water supply reservoir, Goose Lake



Water storage barrel outside house



Models of experimental houses designed by Arctic Health Research Center for construction in native villages. Designs, construction methods, and materials are adapted to varying environmental conditions and needs of individual villages.

which records of fuel consumption, temperature and humidity levels, and other data are kept. Since economy is a major consideration, every effort is made to utilize local building materials. Several of the experimental houses incorporate features commonly lacking in typical native homes, such as separate bedroom space, kitchen sinks, sanitary toilet facilities, ventilating devices, and, in one instance, an inside well.

### Control of Insect Pests

The bloodsucking flies and their control comprise one of the most important environmental problems in Alaska. More than 100 species of mosquitoes, black flies, snipe flies, punkies, and horse flies occur in the State, and half of them bite humans. Their biting and the annoyance they cause are a severe handicap to essential outdoor occupations and to recreational activities, and their bites occasionally may lead to serious secondary infections or allergic reactions. Their status as vectors of disease is still unknown.

In southeast Alaska the biting-fly season lasts about 6 months, from mid-April into October. In localized areas, biting is intense for relatively short periods, depending on which pest is involved. The biting season becomes progressively shorter, but less localized and more intense, northward to the Arctic slope, where it lasts less than a month, during late June and early July. Along the Arctic slope, biting by insects is perhaps the most intense in the

world, with a few species of *Aedes* mosquitoes almost the sole offenders.

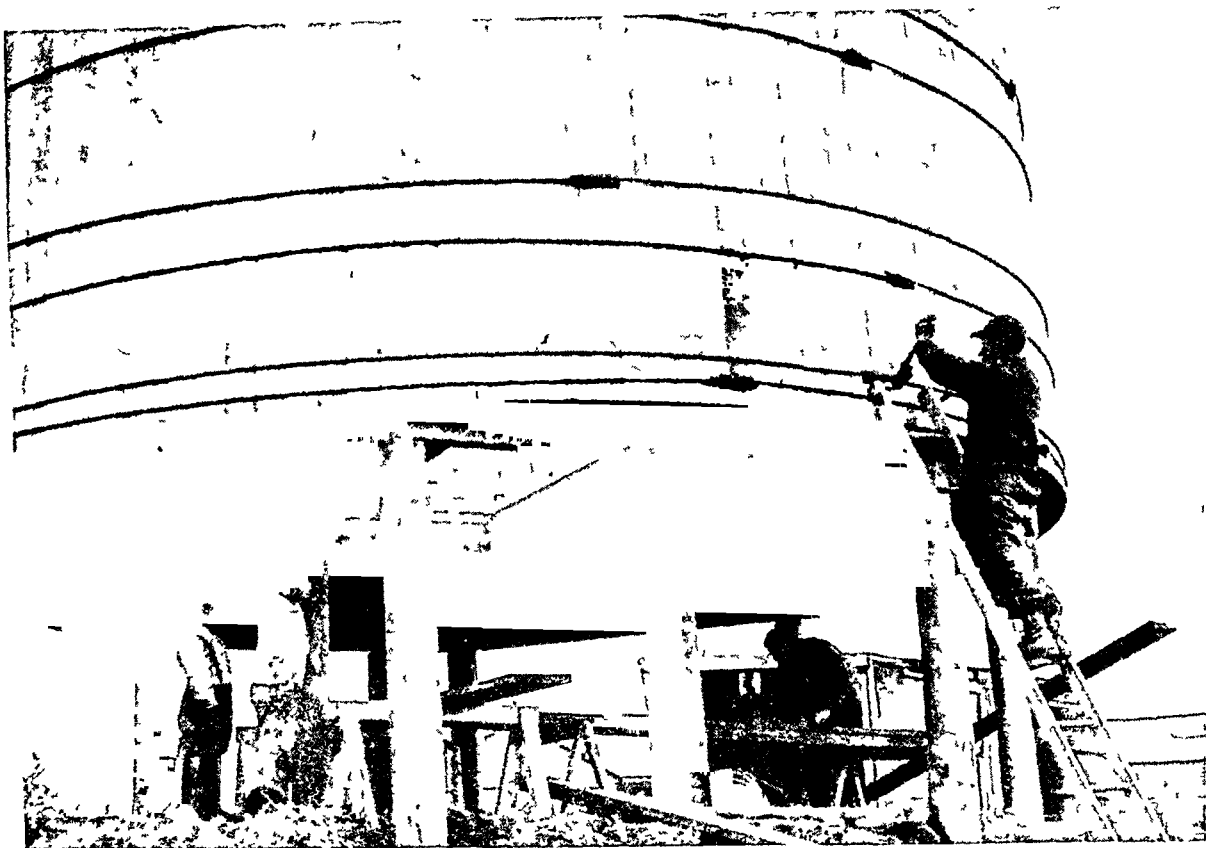
Throughout much of the State the mosquitoes (*Culicidae*) are considered the worst pest. In the forested regions the *Anopheles* and *Culiseta* females emerge from hibernation and begin to bite even before the snow has entirely disappeared. Biting increases as the *Aedes* matures, and the peak of the biting season is reached by mid-July.

Twenty-eight species of mosquitoes occur in Alaska, of which 10 are major pests, responsible for most of the biting. All Alaskan mosquitoes produce but one generation a year. They breed in stagnant water, and Alaska is well suited for them, with its vast expanses of boggy tundra, coastal marshes, swampy valleys, and upland bogs.

In some localities the black flies (*Simuliidae*) are considered worse pests than the mosquitoes. Of the 42 species of black flies known in Alaska, 11 are vicious biters. Reaction to bites is usually pronounced, and swelling and itching last a week or more and can be temporarily disabling.

Black flies, or "white sox" as they are called locally, breed in running water and in all kinds of streams, from the smallest trickle to large rivers. In some streams the larvae and pupae are of considerable importance as fish food. Most species produce one generation a year.

In the Panhandle and in some mountainous localities in central Alaska, the snipe flies (*Leptidae*, *Symphoromyia*) are the major pests during July and August. Two species are known to occur in Alaska and both bite humans.



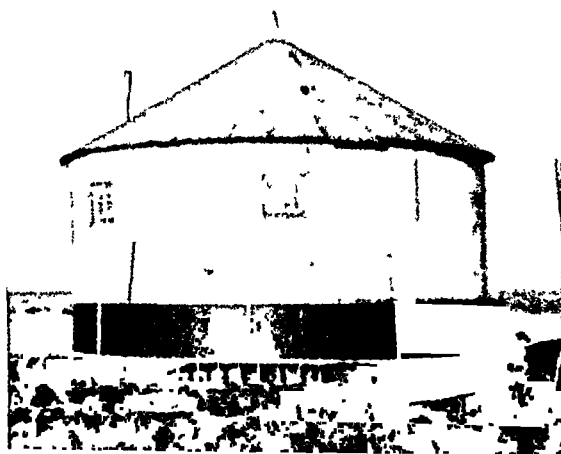
Beginning construction of experimental house at Eek (see center model, p. 906). Basic design patterned after circular wood stave water tank; circular shape minimizes effect of wind action and drifting snow.

The bite is decidedly painful, and since biting occurs in open areas in bright sunshine, snipe flies are particularly discouraging to outdoor activities.

The precise breeding place of snipe flies is unknown, but it is thought to be wet, peaty soil in the mountains near timberline.

In some coastal towns, and occasionally inland, the punkies (Hleleidae, *Culicoides*) are the major outdoor pests. The biting season is from June through August, with July and early August the worst. At least six species are known to occur in Alaska and they all bite humans. The punkies breed in water or wet soil and along the coast in the intertidal mud where sedges are growing. The complete life history of only one species has been studied in Alaska, and it produces one generation a year.

In Alaska the horse flies (Tabanidae) are widespread, but they are usually slow to bite humans. About 30 species are known in the State and perhaps a third of them attack hu-



Completed experimental house at Eek. Entrance to living quarters is by stairs from below, to minimize heat loss. Enclosed space at ground level used for storage. Upper section (living quarters) insulated with plastic foam covered with exterior plywood; local grass used for insulation of lower section, covered with tar paper.

mans. Their chief importance is as pests of livestock and as possible transmitters of tularemia. They bite during bright sunshine when the temperature is high, around 70° F., during July and August. Tabanids usually breed in water or wet soil. Biological studies of these flies have not been made in Alaska.

Adulticiding with chemicals, mostly DDT, is the major insect control activity practiced in Alaska at present. It is expensive and gives only temporary relief but is used because the only biological information necessary is the flight and biting habits of the pest concerned. The insecticide is usually applied by airplane because few towns have the necessary roads for dispersal by ground mobile units. Stationary devices designed for dispersal of DDT aerosols and mists have proved fairly satisfactory for small installations such as camps, lodges, and homesites, but only when operated by trained personnel.

Larviciding provides more permanent control, and the biological information necessary for such an approach is now available to a large extent for the mosquitoes and to a lesser degree for the black flies and for one species of punkies. Biological information is entirely lacking for the snipe flies and horse flies. Also lacking are the trained personnel to make the preliminary habitat surveys required for effective larviciding. Black-fly ground larviciding should be done only by trained personnel because overdosage of chemicals would lead to disastrous results on fish spawning.



Sod-covered frame house, Point Hope. Note skylight and dog on roof.

Unfortunately, many of the most desirable permanent control measures, which do not involve chemicals, such as draining, filling, and flushing, are impracticable in Alaska because of the vastness of the breeding areas. Even in southeast Alaska, where the mosquito-breeding sites are limited by sea and mountains, dense undergrowth prevents the use of satisfactory control measures. But adulticiding and larviciding are economically feasible, especially in densely populated areas, when properly done.

Biting flies are a community problem—so also is their control. Community organization in the form of abatement districts, with trained personnel to perform the control operations, is needed for efficient control of these pests without risk to fish or wildlife, two of Alaska's important natural resources.

### *Food and Nutrition*

Generalizations as to dietary practices and nutrition in Alaska are impractical because local circumstances alter custom. Actual food intakes, in any locality, are determined by cost, availability, and individual preference, usually in that order. Where direct transportation from the "southern 48" is available, cost is the controlling factor in dietary practices. In remote areas, availability dictates the diet.

Since the bulk of Alaska's food supply is imported, the resultant high cost of various items has a direct bearing on the dietary habits of almost all Alaskans, for few families nowadays, however remotely located, follow the old ways of gathering food from local sources exclusively. Overall consumption of fresh fruits and vegetables and whole fluid milk is below national averages, because a high proportion of these items must be imported.

Table 8 provides a comparison of current retail prices of selected food items in certain Alaskan cities with prices of these items in the United States and Seattle. All of the cities listed, except Nome, have direct access to surface routes, either water or highway, as well as air transportation the year round. Nome prices are therefore more typical of those found in outlying areas to which food supplies must generally be reshipped by air from the major transportation centers.

Table 8. Average retail prices of selected food items in five Alaskan cities, compared with Seattle and United States, March 1960<sup>1</sup>

Food item	Unit	U.S. average	Seattle	Ketchikan	Juneau	Anchorage	Fairbanks	Nome
Flour.....	5 lb.	\$0.55	\$0.58	\$0.72	\$0.78	\$0.80	\$0.94	\$0.94
Bread.....	1½ lb.	.30	.35	.42	.46	.47	.48	.55
Ground beef.....	1 lb.	.52	.49	.69	.64	.64	.82	.90
Milk.....	Quart	.25	.23	.36	.35	.40	.48	.73
Milk (evaporated).....	14½ oz.	.16	.16	.18	.18	.20	.22	.23
Orange juice (frozen).....	6 oz.	.23	.24	.30	.28	.31	.41	.49
Oranges.....	1 lb.	.21	.25	.22	.28	.26	.26	.47
Lettuce.....	1 lb.	.20	.17	.28	.32	.32	.44	.61
Eggs (large grade A).....	Dozen	.48	.56	.60	.56	.58	.78	1.06
Butter.....	1 lb.	.74	.75	.79	.78	.85	.91	1.11
Total price of 40 "market basket" items.....		\$15.75	\$16.64	\$19.48	\$20.17	\$21.16	\$24.80	\$28.37
Percentage of Seattle prices.....		95	100	117	121	127	149	170

<sup>1</sup> See reference 15.

Although dairy and poultry farming are leading sources of income among Alaskan farmers, high local production costs keep retail prices of these items in local markets high. Thus, Alaska-produced eggs must compete with lower priced eggs imported by air, highway, or water. Fresh grade A jumbo eggs produced in the nearby Matanuska Valley, for example, are currently selling in Anchorage markets for \$1.09 a dozen, while some Anchorage grocers are advertising specials of imported grade AA medium eggs for 49 cents a dozen.

Truck farming in Alaska is increasing steadily, and locally grown vegetables appear seasonally in local markets and at roadside stands in increasing quantities each year. Here again, however, local produce is not yet grown in quantities sufficient to compete in price with the volume imported by wholesale firms. Nor, of course, can local producers compete on a year-round basis.

Some newcomers to Alaska still regard Alaska-grown vegetables with some suspicion, apparently assuming that jumbo size and rapid growth must mean a tough, unpalatable product. Actually, Alaska's vegetables, harvested in their prime, possess superior palatability. Most of the crops, because of their rapid growth, are harvested while still relatively young and tender. Salad crops, for example, are sometimes marketed when no more than 4 weeks old.

In general, the non-native in Alaska eats as

well as his "southern" neighbor, if at greater expense. Unless his fixed expenses for items such as housing, utilities, and clothing demand a disproportionately large share of his income, his diet is generally adequate.

The diet of the Alaskan Eskimo and Indian is undergoing marked changes. The entire native population is going through a rapid cultural transition, and many have abandoned the life of the nomad hunter to work for wages. Unfortunately the time for wage work, usually seasonal in Alaska, coincides with the time when native food-gathering activities would normally occur.

Many natives have developed a liking for "white man's foods," often, unfortunately, for the less nutritious items. They have become particularly fond of coffee, tea, candy, pop, chewing gum, especially bubble gum, macaroni, "store" bread, and prepared cake and other mixes. Whereas formerly the bulk of their diets consisted of fish, often eaten whole, or meat eaten raw or partially cooked, they are substituting processed or canned foods whenever cash income will permit.

According to laboratory analyses, many of the native foods, now being abandoned, are of high nutritive quality. The most important natural Alaskan sources of vitamin A are animal livers, sea mammal oils, and wild edible greens. The fresh wild greens are excellent sources of ascorbic acid, as are cloudberry and some of

the fresh seaweeds. A mere 100 grams of seaweed is equal in ascorbic acid content to a medium-sized orange. Good iron sources are available from both land and sea mammal livers, wildfowl, wild edible greens, blackfish and needlefish, especially the latter two, since the Eskimo eats the entire fish, including the entrails. Clams, blackfish and needlefish, willow leaves, and certain seaweeds (*Alaria*, *Laminaria*, and *Agarum*) are rich in calcium.

The supplemental feeding program in the Bureau of Indian Affairs schools has influenced eating habits in some villages. Many of the foods served at school as hot breakfasts, lunches, or "snacks", have become favorites with the children. Teachers try to use these supplemental feedings as learning situations. Village women sometimes help with the lunch program, thus affording additional opportunity for nutrition education.

During the past few years, increased welfare allowances under the aid to dependent children and old-age assistance programs have made regular purchase of store foods possible. In many instances considerably more guidance in wise purchasing and economical use of purchased foods is needed. The village store or trading post usually constitutes the main source of supply, although some individuals and families have adopted the practice of ordering food supplies by airmail order or charge account from the nearest city. The village trader usually stocks his shelves according to local demands, and itinerant health personnel frequently suggest to him the stocking and promoting of certain items, such as powdered milk, as a means of encouraging greater as well as more economical use of milk.

Food intakes among native groups in Alaska vary according to location as well as income. While seasonal shortages in the natural food supply occur occasionally in all parts of Alaska, they are usually more severe and more frequent in the tundra areas than in coastal villages.

The trend toward larger and permanently located villages also influences food supply. Populations of some villages are increasing, largely as a result of decreasing mortality rates. In other villages, establishment of permanent schools and post offices has attracted new residents from surrounding communities. Natural

food supplies around these growing villages are dwindling as the hunters and trappers tend to confine their food-gathering activities to a smaller radius.

From the standpoint of changed feeding practices, the nutrition of the infant and preschool child is probably in the most precarious situation. Whereas in earlier days the Eskimo mother breast fed her baby for at least 2 years or longer, the practice of bottle feeding, learned during periods of hospitalization for tuberculosis or through other contacts, has been widely adopted. While the small infant on the bottle generally receives a formula of half evaporated milk and half water and is fed on demand, toward the end of the first year the proportion of milk to water is often drastically reduced.

The idea of supplemental feedings for the bottle-fed baby is slowly being adopted. In some villages health and medical personnel have succeeded in influencing village councils to provide, at village expense, suitable vitamin preparations for all mothers with small infants. School-age children have been receiving multivitamin pills in conjunction with the Bureau of Indian Affairs school lunch program for the past several years. Multivitamin pills also have been distributed to participants in the tuberculosis chemotherapy program. To date, however, the toddler and the preschool child have not generally been included in these programs.

In spite of the numerous nutritional hazards noted, a recent survey (10) has revealed that specific nutritional deficiencies are not a health problem among adult Eskimos and Indians at this time. Despite low intakes of certain nutrients, little clinical evidence of deficiencies was discovered.

Study of dietary records collected seasonally, in conjunction with the above survey, from nine Eskimo and two Indian villages over a period of 2½ years has afforded much valuable information. The following comments are based on preliminary analyses of some of the survey findings.

Except during food shortages the protein intake of Eskimos and Indians is more than adequate. Intakes of carbohydrate, fat, vitamin A, thiamin, riboflavin, niacin, and iron vary widely among residents of the villages under



Preparing to butcher a beluga, or white whale, favorite meat of Eskimos along the northwest coast of Alaska and the lower Yukon River. Rack under whale represents forward step in sanitary handling of food. Formerly butchering table was the beach itself, often littered with soil from both dogs and humans.

study. Dietary intakes in some villages show obvious nutritive shortages when compared with allowances recommended by the National Research Council. Notable among these shortages are iron, in the tundra villages where the main source of protein and iron is fish, vitamin A, and ascorbic acid. Calories from fat make up from 22 percent to more than 50 percent of the total calories: the total calorie intake is often well below that recommended by the National Research Council for comparable age groups.

### ***Outlook***

Alaska has made considerable progress against great odds in the field of health and medical care in the last 20 years. The outlook for continued health progress in the 49th State is promising, but so many contingencies are involved that predictions can be little more than arbitrary conjectures.

Alaska has abundant resources, sufficient to support a much larger population, but needs more capital and more people to develop these resources.

It seems likely that Alaska's present major health problems—those stemming from infectious diseases and inadequate sanitation—will continue to claim priority for some time. Most of these problems could be reduced materially with sufficient health personnel and facilities for service, education, and research. Much of Alaska's past progress in overcoming major health problems can be attributed to strong Federal support and increasing Territorial-State appropriations.

Alaska also needs a larger and more stable population for development of potential leaders in the health professions. The interest and intent to develop training facilities for medical and paramedical personnel within the State are already evident.

Alaska's greatest resource is people. The



determination and willingness of Alaskans to attack seemingly insurmountable problems have been amply demonstrated. Given an adequate financial base and wise leadership, the 49th State should be well able to sustain and expand present health services and facilities to meet increasing and emerging demands.

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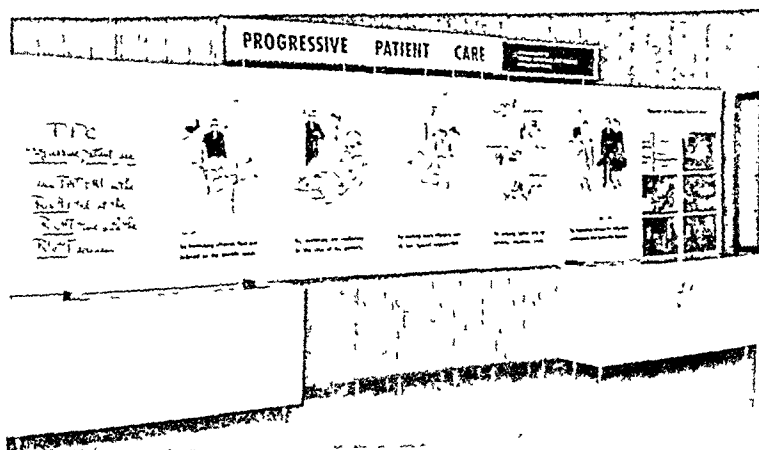
## exhibits

### Progressive Patient Care

Progressive patient care, the concept of tailoring medical services to meet the patient's needs, is the subject of an explanatory pamphlet and exhibit developed by the Division of Hospital and Medical Facilities, Public Health Service.

The five elements of patient care encompassed by PPC, as the plan is called, are explained as intensive, intermediate, self- and long-term care within the hospital, and home care.

Benefits are described as services tailored to the patient's needs, increased confidence by physicians in the care received by their patients, more effective use of the nursing staff, better use of hospital services, facilities, and staff, and extended services to the community for long-



Specifications: A 7-panel exhibit, 18 feet long, 7 feet 6 inches high, and 2 feet deep; total weight about 1,300 lbs., including the 4 packing crates. Literature may be displayed on the top of the cabinets at each end. One 500-watt and one 250-watt electrical connections are required.

term ambulatory and home care patients.

The exhibit is available for loan without charge, exclusive of shipping charges.

Further information, including ar-

rangements for borrowing, can be obtained from the Division of Hospital and Medical Facilities, Public Health Service, U.S. Department of Health, Education, and Welfare, Washington 25, D.C.

mainly from cases reported as mild to severe gastroenteritis or diarrhea occurring with greatest frequency in young children. Investigators at the Arctic Aeromedical Laboratory, Ladd Air Force Base, Fairbanks, in 1958 found that at Fort Yukon intestinal disturbances occurred eight times more often in children aged 0-9 years than in any other age group. A report on the results of this study is in preparation.

The occurrence of intestinal infections in Alaska has been reviewed by Gordon and Bab-bott (2), Fournelle and associates (4), and others. The division of health morbidity records support their findings and show prevalence of these infections to be greatest during July and August, with the highest incidence in children under 10 years of age. Single strains of *S. bareilly*, *S. cubana*, *S. derby*, *S. give*, *S. heidelberg*, *S. newington*, *S. paratyphi*, *S. urbana*, 2 strains of *S. infantis*, 10 strains of *S. muenchen*, 7 strains of *S. newport*, 2 strains of *S. panama*, 11 strains of *S. reading*, 4 strains of *S. tennessee*, 3 strains of *S. thompson*, 2 strains of *S. worthington*, and 68 strains of *S. typhosa* were isolated from human cases and carriers. The remaining types were isolated from both man and animals. *S. oslo* (3 strains), *S. montevideo* (19 strains), and *S. oranienburg* (7 strains) were isolated from man and dogs, while *S. schottmuelleri* (2 strains) and *S. manhattan* (4 strains) were isolated from man and gulls (*Larus glaucescens*). *S. typhimurium* was isolated from man, dogs, and gulls.

Poultry and other birds are frequently associated with salmonellosis in other parts of the world. However, poultry and other domestic birds are not common in Alaska, but 77 different species of wild birds, totaling 399 individuals, were collected during the period September 22, 1944, to May 5, 1955. The majority of these were migrant birds visiting southeastern Alaska. A few birds were collected in the Fairbanks area and along the Richardson and Glenn Highways to and including the Anchorage area. The contents of the gizzard and intestine were cultured directly on *Salmonella-Shigella* agar and into enrichment broths and, with the exception of pellets and intestinal contents from *L. glaucescens*, were negative for salmonellae.

In addition to 14 gulls collected and examined in Ketchikan (9) (1 strain of *S. manhattan*), 173 gull pellets, indigestible material cast out by regurgitation, were examined at Juneau during December-March of each of the years 1951-55. Two strains of *S. typhimurium*, one strain of *S. schottmuelleri* phage type variation of group I, and one strain of *S. sandiego* were isolated.

A survey of *Salmonella* in dogs in Alaska was made by Schlotthauer in 1955-56 (personal communication). A total of 452 samples were collected by means of rectal swabs for bacteriological examinations and 1.5 percent of the animals sampled had *Salmonella*. Six isolations of *S. typhimurium* were made at Fort Yukon in June 1955 and one isolation of *S.*

Frequency of occurrence of *Salmonella* types

<i>Salmonella</i> type	Strains		<i>Salmonella</i> type	Strains	
	Number	Percent		Number	Percent
<i>S. typhimurium</i> .....	81	32.9	<i>S. schottmuelleri</i> .....	2	0.8
<i>S. typhosa</i> .....	68	27.7	<i>S. worthington</i> .....	2	.8
<i>S. montevideo</i> .....	19	7.7	<i>S. bareilly</i> .....	1	.4
<i>S. reading</i> .....	11	4.5	<i>S. cubana</i> .....	1	.4
<i>S. muenchen</i> .....	10	4.1	<i>S. derby</i> .....	1	.4
<i>S. oranienburg</i> .....	7	2.9	<i>S. give</i> .....	1	.4
<i>S. newport</i> .....	7	2.9	<i>S. heidelberg</i> .....	1	.4
<i>S. enteritidis</i> .....	6	2.5	<i>S. minnesota</i> .....	1	.4
<i>S. manhattan</i> .....	4	1.6	<i>S. newington</i> .....	1	.4
<i>S. tennessee</i> .....	4	1.6	<i>S. paratyphi</i> .....	1	.4
<i>S. thompson</i> .....	3	1.2	<i>S. sandiego</i> .....	1	.4
<i>S. oslo</i> .....	3	1.2	<i>S. urbana</i> .....	1	.4
<i>S. infantis</i> .....	2	.8	<i>Salmonella</i> spp.....	5	2.0
<i>S. panama</i> .....	2	.8			

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## CDC Training Program, 1960-61

Training courses in the epidemiology and control of communicable diseases offered by the Communicable Disease Center, Public Health Service, from October 1960 through June 1961 are listed below. This list, together with the courses in laboratory methods listed in *Public Health Reports*, July 1960, represents the complete schedule for the period. Courses listed under "Organization and Orientation" are especially developed for people from other countries. Additional information and application forms may be obtained from either the Chief, Communicable Disease Center, Atlanta 22, Ga., or the appropriate regional office of the Department of Health, Education and Welfare.

### Epidemiology

- Principles of epidemiology (101). Jan. 16-20; Atlanta.
- Applied epidemiology (112). Nov. 14-18; Atlanta. Apr. 10-14; Cincinnati.
- Epidemiology for nurses (121). Spring; Atlanta.
- Principles of epidemiology for nurses (122). To be announced; by arrangement with schools of nursing in universities and colleges.
- Epidemiology for veterinarians (140). Feb. 6-10; Atlanta.

### Vector Control

- Epidemiology and control of vector-borne diseases (201). Feb. 13-17; Atlanta. Apr. 3-7; Denver.
- Rodent control, operational (212). By arrangement; Atlanta.
- Insect and rodent control (221). June 5-16; Atlanta.
- Mosquito control (231). Oct. 31-Nov. 4; Atlanta.
- Identification and biology of arthropods (241). Jan. 9-20; Atlanta.

### Environmental Control

- Environmental sanitation (301). Feb. 13-May 12; Atlanta.
- Epidemiology and control of food-borne diseases (311). Nov. 14-18; Region II. May 22-26; Atlanta.
- Applied procedures for control of food-borne diseases (312). Oct. 24-28; Denver.
- Milk pasteurization controls and tests (332). Oct. 3-21; Region II. Nov. 1-3; Atlanta. Spring (2 weeks); Region III. Spring (3 weeks); Region IV.

- Milk sanitation, administrative (333). Feb. 6-10; Denver.
- Housing hygiene, operational (363). Mar. 13-Apr. 14; Atlanta.
- Housing hygiene, environmental (367). Mar. 27-31; Atlanta.

### Venereal Disease Control

- Venereal disease annual postgraduate course (401). Time and place to be announced.
- Nursing work conferences on the control of venereal disease (421). Time and place to be announced.
- Nursing in venereal disease control (422). Monthly, September through June; New York Department of Health, Bedford Health District, John F. Mahoney Training Center, Brooklyn.
- Venereal disease contact interview and investigation (431). Oct. 24-Nov. 4; Jan. 16-27; Feb. 20-Mar. 3; Mar. 27-Apr. 7; May 15-26; Venereal Disease Training School, Fulton County Health Department, Atlanta. Nov. 28-Dec. 9; Jan. 16-27; Mar. 20-31; May 8-19; Venereal Disease Training School, Detroit City Health Department. Nov. 14-25; Feb. 6-17; May 8-19; Venereal Disease Training School, Los Angeles Department of Health.
- Current laboratory methods in the serology of syphilis (454). Nov. 28-Dec. 16; Jan. 30-Feb. 17; Apr. 10-28; Chamblee.
- Management and control of syphilis serology by the central laboratory (455). May 8-19; Chamblee.
- The *Treponema pallidum* immobilization (TPI) test (456). By special arrangement only; Chamblee.
- Introduction to fluorescent antibody methods—identification of the *Neisseria gonorrhoeae*. Oct. 17-21; Mar. 6-10; Chamblee.
- The fluorescent treponemal antibody (FTA) test (458). Oct. 24-28; Mar. 13-17; Chamblee.

### Laboratory Methods

- Fluorescent antibody techniques in the public health laboratory (845). Nov. 7-18; Atlanta.

### Organization and Orientation

- Principles, organization, and practice of communicable disease control (701). Summer 1961; Atlanta.
- Applied epidemiology in communicable disease control (712). June 19-July 14 (tentative); Atlanta.
- Nursing aspects of communicable disease control (720). June 26-30 (tentative); Atlanta.
- Environmental aspects of communicable disease control (730). June 12-July 7; Atlanta.

The designation *Leptospira mini georgia* is proposed for a new subserotype of *L. mini* isolated from wild mammals. A case of human infection with *L. mini georgia* is reported on pages 922-924 and the first isolation of *Leptospira pomona* from a woodchuck, on page 925.

## A New Leptospiral Subserotype in the Hebdomadis Group

MILDRED M. GALTON, Sc.M., GEORGE W. GORMAN, B.S.,  
and EMMETT B. SHOTTS, Jr., M.S.

INVESTIGATIONS concerning possible wild animal reservoirs of leptospires were conducted by the Communicable Disease Center of the Public Health Service from 1953 to 1958 at Newton, Ga. (1-3). Leptospires isolated between March 1956 and May 1957 from 15 raccoons (*Procyon lotor*), 4 opossums (*Didelphis marsupialis*), and 1 striped skunk (*Mephitis mephitis*) appeared to be identical and to belong to the hebdomadis serogroup. Serologic characterization of these strains, recorded in this paper, indicate that they are a new subserotype of *Leptospira mini*.

*L. mini* AB Sari was isolated by Mino in 1941 from the blood of an Italian ricefield worker with leptospirosis and described by Babudieri (4). *L. mini* A Szwarzizak was isolated first in Queensland in 1952, also from the blood of a human patient, and reported by Smith and co-workers in 1954 (5). Several years later Van der Hoeden (6) isolated the Szwarzizak strain

from the kidneys of a hedgehog in Israel. The Barthélémy strain was isolated by Van Riel and Szpajshendler (7) from the blood of a patient with a fatal case of leptospirosis in the mining region of the Belgian Congo.

### Methods

*Source of strains.* All the animals from which leptospires were isolated were trapped in Georgia, 11 in Calhoun County, 5 in Dougherty County, and 2 each in Baker and Seminole Counties. These counties are in the southwestern part of the State between the Flint and Chattahoochee Rivers. The leptospiral strains were isolated by direct culture of a kidney tissue suspension into Fletcher's semisolid medium (8).

*Antiserums.* Immune serums were prepared according to previously described methods (3) with the exception of *L. wolffii* A, *L. borincana*, *L. worsfoldi*, *L. hemolyticus*, *L. ricardi*, *L. jules*, *L. mini* A Szwarzizak and *L. kabura*, which were prepared by inoculation of live Fletcher's cultures into rabbits. These eight antiserums were supplied by the Division of Veterinary Medicine, Walter Reed Army Institute of Research, Washington, D.C.

*Antigens.* Leptospiral antigens were pre-

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pared as previously described (3) except they were not formalinized. If the antigens appeared too dense, cultures were diluted with sterile Stuart's medium (9).

**Microscopic agglutination test procedure.** Serial twofold dilutions were prepared in buffered 0.85 percent saline to provide serum dilutions of 1:25 through 1:102,400. To 0.2 ml. of each serum dilution, 0.2 ml. of antigen was added. The tubes were shaken, incubated at 30° C. for 3 hours, and examined. A drop from each dilution was placed on a slide and examined by dark ground microscopy, using low-power objective and 15× oculars without a coverslip. The degree of agglutination or "lysis" or both were read as 1+, with at least 25 percent of the leptospire agglutinated or "lysed"; 2+, approximately 50 percent; 3+, about 50-75 percent; and 4+, 75-100 percent. The end point was taken as the last dilution showing a 1+ reaction.

**Agglutinin-absorption procedure.** Antigens for absorption studies were prepared from 5- to 7-day-old cultures grown in Stuart's medium in 500 ml. amounts. Cultures were killed by the addition of formalin to provide a concentration of 0.3 percent. The cultures were centrifuged at 5,000 × gravity in a Servall for 25 minutes. The remainder of the agglutinin-

absorption procedure was essentially the same as that described by Alexander (10). Microscopic agglutination tests with the absorbed serums were performed with antigens prepared as mentioned above but killed by the addition of formalin to provide a concentration of 0.3 percent. The absorbed serums were diluted twofold to provide final serum dilution of 1:100 to 1:51,200 after the addition of antigen. The tubes were incubated in a waterbath at 52° C. for 2 hours, refrigerated for 1 hour, and read as described above.

### Findings

The first isolate in this group of cultures, LT117, grew very slowly in liquid medium for the first 10 months and was carried in both Stuart's and Chang's (11) media. Frequently the culture failed to grow in one of these liquid media and it was necessary to continue to subculture in Fletcher's medium and transfer repeatedly from these to the liquid media before the culture became adapted. However, after about 12 months the culture began to grow quite well in Stuart's medium and has continued to do so.

Initial screening of antigen prepared from strain LT117 with antisera against *L. aus-*

Table 1. Cross agglutination studies on leptospiral strain LT117 and related isolates

Antiserum	Homologous titer	Antigen <sup>1</sup>										LT117 serum + 1-18 antigen-
		LT117	LT138	LT146	LT153	LT164	LT172	LT185	LT186	LT188	LT196	
<i>heblomadis</i>	12,800	800	400	—	—	—	400	800	800	800	800	400
<i>medanensis</i>	12,800	—	—	—	—	—	—	50	—	—	—	61
<i>wolffi</i>	12,800	200	256	128	128	32	200	200	50	100	100	32
<i>hardjo</i>	51,200	—	—	—	—	—	—	—	—	—	—	32
<i>sejroe</i>	6,400	50	—	128	128	—	—	100	50	—	100	—
<i>sarkoebing</i>	25,600	200	200	—	—	—	100	400	200	100	800	50
<i>wolffi</i> 1	51,200	200	256	512	128	64	—	100	—	—	400	512
<i>kremastos</i>	6,400	3,200	1,024	1,024	1,024	512	800	1,000	800	800	800	256
<i>borincana</i>	51,200	12,800	16,384	4,096	4,096	8,192	6,100	25,600	6,400	6,400	6,400	32
<i>worsfoldi</i>	102,400	12,800	6,400	2,048	4,096	2,048	12,800	25,600	6,400	6,400	6,400	128
<i>hemolyticus</i>	51,200	400	200	1,024	256	128	100	400	200	200	400	512
<i>mini A Szwarzjak</i>	51,200	25,600	—	—	—	—	—	—	—	—	—	3,200
<i>mini AB Sari</i>	6,400	400	512	512	512	256	400	400	400	400	400	1,600
<i>jules</i>	25,600	12,800	12,800	—	—	—	3,200	6,400	3,200	3,200	12,800	200
<i>kabura</i>	102,400	3,200	1,600	—	—	—	1,600	3,200	1,600	1,600	6,100	400
<i>barthélémy</i>	12,800	6,100	—	—	—	—	—	—	—	—	—	800
<i>ricardi</i>	51,200	—	—	—	—	—	—	—	—	—	—	128
LT117	6,400	6,400	3,200	2,048	—	—	6,400	12,800	6,400	6,400	12,800	6,400

<sup>1</sup> Live antigen.

NOTE: — indicates no reaction in a 1:50 dilution.

*tralis*, LT95; *L. autumnalis* (AB), Akiyama A; *L. bakeri*; *L. ballum*, S102; *L. grippotyphosa*, Moscow V; *L. pomona*, LT91; and *L. sejroe* Mellersdorf, the battery used to test isolates from this Communicable Disease Center field station, yielded agglutination only with *L. sejroe* serum in a dilution of 1:50. Subsequent testing with antisera for the remaining 28 serotypes recognized in the Wolff-Broom schema (12) revealed similar low titers with other members of the hebdomadis serogroup. Antiserum against LT117 was then prepared and cross agglutination studies performed with live antigens and antisera of serotypes of the hebdomadis serogroup (13). Results of these studies indicated that LT117 was closely related to the hebdomadis serogroup, as shown in table 1.

In agglutinin-absorption studies with *L. borincana*, *L. worsfoldi*, *L. kremastos*, *L. hemolyticus*, *L. wolffii* A, *L. mini* AB Sari, *L. mini* AB Barthélémy, *L. mini* A Szwajizak, *L. jules*, and *L. kabura* antisera, LT117 failed to reduce the homologous titer significantly except in the *L. mini* antisera. The serologic characteristics of the Barthélémy strain were described recently by Wolff and Bohlander (14), and it was shown to be very closely related to Sari. For practical reasons they considered Barthélémy as a complete biotype of *L. mini*. To confirm the apparent serologic relationship between LT117, Sari, and Szwajizak, a box titration of the cross agglutinin-absorption reactions among these three strains was performed by A. D. Alexander and L. B. Evans, Division of Veterinary Medicine, Walter Reed Army Institute of Research, Washington, D.C. These findings, as shown in table 2, indicate that LT117 is a subserotype of *L. mini*. Therefore, the subserotype designation *L. mini georgia* is proposed for strain LT117.

During these studies, 19 additional isolates were obtained from raccoons, striped skunks, and opossums that reacted to the homologous titer with LT117 antiserum. Nine of these cultures were tested against antisera for other members of the hebdomadis serogroup and showed a cross agglutination pattern similar to LT117 as shown in table 1.

Blood was collected from each of the animals

the same day the kidney suspensions were cultured. The serum from 16 animals was available for agglutination studies. Of these significant antibodies against LT117 were detected in dilutions ranging from 1:50 to 1:800 in eight animals. Four of the samples were tested with antigens of all serotypes of the hebdomadis group except *L. ricardi*, and no antibodies were detected in two. A titer of 1:200 to Sari was observed in the serum from one skunk that showed only a plus minus reaction (at the lowest dilution, 1:50) with LT117 antigen. These findings are shown in table 3.

## Discussion

*L. mini georgia* represents the second new leptospiral strain that has been isolated in the United States. Since 1952 (15) increasing serologic evidence has suggested that infections with another member of the hebdomadis group, *L. sejroe*, occur in cattle. While the etiological significance of these bovine *sejroe* reactors has not been determined completely, infection with *L. hardjo*, a closely related serotype, has been

**Table 2. Results of cross agglutinin-absorption test with *L. mini* AB Sari, *L. mini* A Szwajizak, and LT117<sup>1, 2</sup>**

Antiserum	Antigen		
	Sari	Szwajizak	LT117
<i>L. mini</i> AB Sari:			
Unabsorbed.....	25, 600	25, 600	6, 400
Absorbed with:			
Sari.....	—	—	—
Szwajizak.....	1, 600	—	—
LT117.....	6, 400	400	—
<i>L. mini</i> A Szwajizak:			
Unabsorbed.....	6, 400	25, 600	6, 400
Absorbed with:			
Sari.....	—	—	—
Szwajizak.....	—	—	—
LT117.....	400	400	—
LT117:			
Unabsorbed.....	1, 600	25, 600	25, 600
Absorbed with:			
Sari.....	—	100	1, 600
Szwajizak.....	—	—	1, 600
LT117.....	—	—	—

<sup>1</sup> Titer expressed as reciprocal of serum dilution.

<sup>2</sup> The techniques employed in these tests are described by A. D. Alexander, L. B. Evans, H. Jefferies, C. A. Gleiser, and R. H. Yager in "Serologic Characterization of the Fort Bragg Leptospire," Proc. Soc. Exper. Biol. & Med. 86: 405-408, June 1954.

NOTE: — indicates no reaction in a 1:100 dilution.

established in Louisiana (16). The possibility that *L. mini georgia* may be involved in leptospirosis in cattle should be considered.

Serums from 6 of the 11 raccoons and 1 of 4 opossums tested were serologically negative against LT117. Serum from two of these six raccoons and the opossum showed a very weak reaction in a 1:50 dilution to Sari antigen. Another raccoon was positive at 1:50 with kabura antigen, but no antibodies to other members of the hebdomadis group were detected in serum from three of the raccoons. This is not unusual as similar findings were observed by Broom and Coghlan (17) in Scotland in serums from mice that were infected with *L. ballum* and with an unidentified member of the hebdomadis group. These authors pointed out the apparently misleading picture that serologic surveys may give concerning the prevalence of leptospirosis in small rodents. It is obvious that a similar situation exists also in the larger wild mammals, such as raccoons.

Subsequent to the isolation of the LT117 cultures from wild animals, serologic evidence of human infection with this serotype was seen in a patient in the Phoebe Putney Memorial Hospital, located in the same county in which sev-

eral isolates were obtained. The initial serum sample from this patient showed a positive slide agglutination test with leptospiral pooled antigens but no reaction by microscopic agglutination when tested with live antigens for the routine battery of 12 leptospiral serotypes (18). A second sample requested a week later showed a microscopic titer of 1:200 against LT117 antigen.

Investigation of this suspected human case of leptospirosis by Dr. L. E. Starr, Georgia Department of Public Health, revealed an interesting history. The patient's physician stated that she had experienced an acute febrile illness of about 1 week's duration, accompanied by muscle aches, chills, and nausea. Tetracycline therapy was commenced about the fourth day after the onset of illness and continued for 6 days. Several weeks prior to onset of her illness the patient had experienced one partial and one complete immersion in the Flint River while fishing. About the time she entered the hospital, several rats discovered in her kitchen and attic were trapped and destroyed. The patient had also had contact with two dogs, but serums from both animals showed titers to *L. pomona* and *L. autumnalis*.

Table 3. Results of agglutination tests on serum from 16 animals infected with LT117

Animal No.	Species	Date collected	County	Antigens					
				LT117	Sari	Szwajizak	Kabura	Jules	Hebdomadis
1956									
LT117	Raccoon	March 19	Baker	—	—	—	—	—	—
LT138	do	June 6	Dougherty	—	± 50	—	—	—	—
LT146	do	July 12	Seminole	—	± 50	—	—	—	—
LT153	do	December 5 <sup>1</sup>	do	—	—	—	—	—	—
LT179	Opossum	October 24	Calhoun	—	± 50	—	—	—	—
LT185	Raccoon	October 30	do	—	—	—	—	—	—
LT186	do	October 31	do	800	400	200	400	400	800
LT188	do	November 1	do	50	± 50	—	—	—	—
LT196	do	November 7	do	50	± 50	—	—	—	—
N-196	do	November 8	do	800	—	—	—	—	—
LT222	do	October 19	do	—	—	—	50	—	—
1957									
LT224	Opossum	January 10	Dougherty	400	800	200	100	—	—
LT250	do	January 30	do	100	400	—	200	—	—
LT252	Raccoon	January 30	do	100	—	—	—	—	—
LT259	Striped skunk	February 20	Calhoun	± 50	200	—	—	—	—
LT282	Opossum	May 17	Dougherty	800	—	—	—	—	—

<sup>1</sup> Received culture.

NOTE: — indicates no reaction in 1:50 dilution.

A third serum sample taken from the patient 2½ months after onset of illness showed a titer of 1:200 to both LT117 and *L. sejroe* antigens. After absorption with LT117 cells, this serum showed no reaction with LT117 or *L. sejroe* antigen but absorption with *L. sejroe* only reduced the original titer of LT117 by 50 percent. This serologic evidence together with the clinical and epidemiological history is at least suggestive of human infection with LT117. More recently, the infectivity of *L. mini georgia* for man was conclusively demonstrated through an accidental infection that occurred in another laboratory. This infection is reported by Goley and co-workers on pages 922-924.

### Summary

A new strain of leptospires belonging to the hebdomadis serogroup is described. This strain is represented by 20 isolates from raccoons, opossums, and a striped skunk. Cross agglutinin-absorption studies indicate that the new strain is a subserotype of *L. mini*, and the designation *L. mini georgia* is proposed.

Agglutination tests with serum from 16 of 20 animals revealed antibodies against LT117, Sari, Sz wajzak, or *kabura* antigen in 10 animals.

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# A CASE OF HUMAN INFECTION WITH *LEPTOSPIRA MINI GEORGIA*

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A. D. Alexander, M.S.  
J. F. Thiel, B.A.  
V. E. Chappell, B.S.

*Leptospira mini*, subserotype *georgia*, was first isolated from the kidney of a raccoon trapped in Georgia in 1956. This serotype is related to members of the hebdomadis group and has repeatedly been demonstrated in naturally occurring infections in raccoons and opossums. Results of a study of leptospire isolates from these animals are reported on pages 917-921. However, the infectivity of this antigenic type for man or domestic animals has never been established. A case of infection in man with *L. mini georgia* incurred through a laboratory accident is presented.

## Case Report

A 53-year-old white male bacteriologist of the Veterinary Division of Walter Reed Army Institute of Research was apparently well until February 11, 1959, when he accidentally pricked his finger with a needle in the course of injecting rabbits with a culture of *L. mini georgia*. He immediately expressed blood from the wound and cleansed it with alcohol. He felt well for

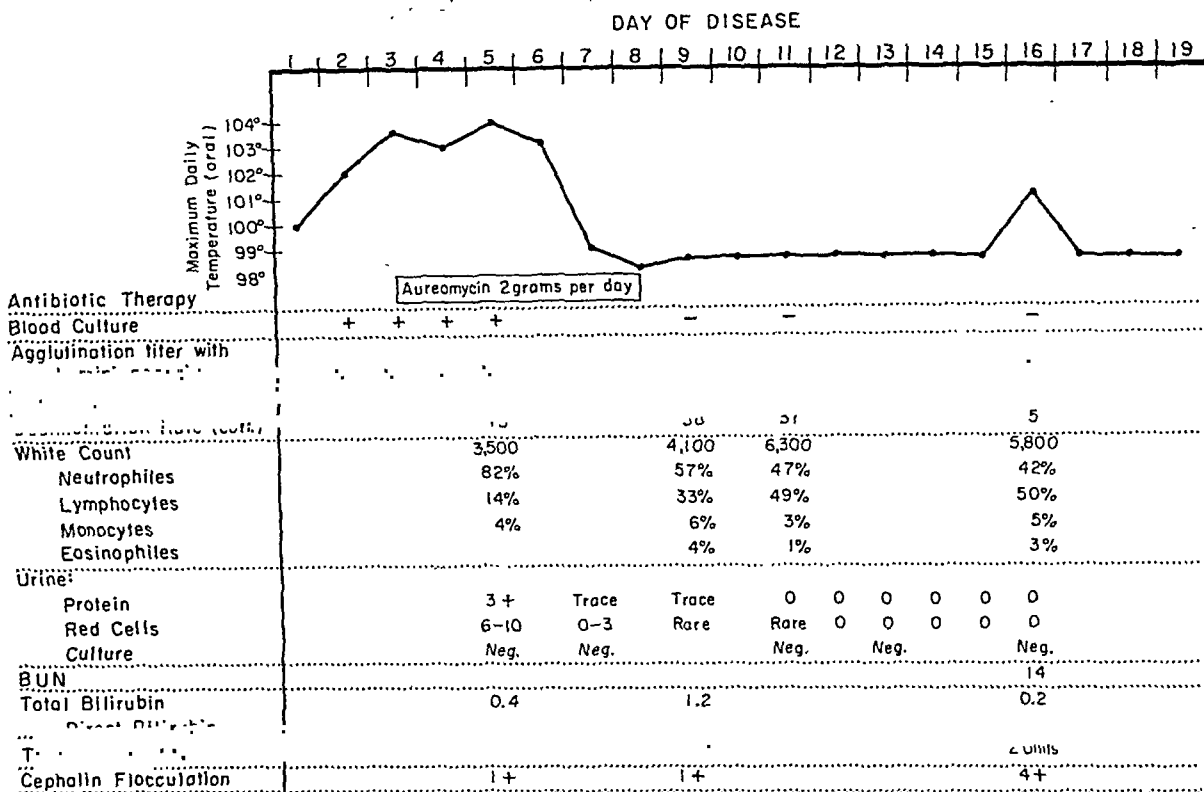
25 days, then on the night of March 8, 1959, he had a sudden onset of chilliness, followed by fever and a severe frontal headache. During the next 36 hours he developed generalized muscular aching and mild nausea. He continued to have chills every 2 or 3 hours, and his temperature rose to 103.4° F.

He was first seen on the second day of illness. At this time he was found to be a well-developed, moderately obese man who appeared acutely ill. His temperature was 103° F., pulse 100, blood pressure 138/85. His chest was clear and there were no palpable nodes. He had no scleral icterus, conjunctival injection, nuchal rigidity, hepatic tenderness, or rash. Laboratory studies were made, and he was given aureomycin, 500 mg. orally, every 6 hours. During the next 48 hours his symptoms continued, and his physical findings remained unchanged except for the appearance of mild conjunctival suffusion. On the night of the sixth day of illness his fever dropped by crisis, and his headache and nausea disappeared. His only complaint for the next 10 days was weakness; however, on March 23, he had a recurrence of fever, malaise, and nausea. This subsided after 24 hours and he continued to improve. Convalescence was characterized by weakness but was otherwise uneventful. He returned to work 28 days after the onset of his illness.

At no time during his illness was there hepatic enlargement or tenderness. There was no evidence of meningeal involvement. He had no history of exposure to animals outside of the laboratory, and none of the other members of his family became ill.

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## Laboratory Findings

The temperature curve and laboratory findings are summarized in the accompanying chart. The leucopenia during the acute phase of the disease should be noted. The albuminuria and hematuria might reflect minimal renal involvement; however, repeated urine cultures failed to demonstrate leptospire.

*L. mini georgia* was recovered by blood culture in Fletcher's medium from the second through the fifth day of disease. This occurred on two occasions in spite of aureomycin blood levels of 1.28  $\mu\text{g./ml.}$  Hamsters and guinea pigs inoculated with the patient's blood developed no evident disease; however, the organism was recovered on culture of their blood and kidneys. Microagglutinations conducted with the isolated organism showed it to be identical to the one involved in the laboratory accident, and convalescent titers of 1:100 to both his own strain and the standard laboratory strain of *L. mini georgia* left no doubt concerning the etiology of his disease.

## Comments

This case demonstrates that it is possible to infect man and produce overt disease with *L. mini georgia*. The clinical picture closely resembled what is commonly called flu or la grippe, and if the history of a laboratory accident had not been documented the diagnosis might well have been missed. It is probable that this type of clinical picture with leptospirosis is much more common than is generally recognized.

The incubation period of 25 days was well defined and, when compared with the previously established incubation periods of 2 to 19 days (1), was inordinately long.

Although leucocytosis is the usual finding in Weil's disease, leucopenia has been reported in less severe leptospiral infections (2). Thus, the finding of leucopenia in this case is not unusual. Similarly, it has been noted frequently that cases of leptospirosis may have a recurrence of fever during the third week of illness (3).

The efficacy of antibiotic therapy in leptospirosis is undecided (4). Several authors feel

that it exerts a favorable effect, particularly if given early in the course of disease (5-8). However, other studies seem to indicate that none of the commonly employed antibiotics are particularly effective in leptospirosis (9, 10), but because of the variability of severity of these infections any form of therapy is difficult to evaluate. In our patient, aureomycin in the dosage used failed to arrest the bacteremia, but we, of course, do not know if the therapy altered the course of the disease.

### Summary

A laboratory infection with *L. mini georgia*, a new subserotype of the hebdomadis group, is reported. After an unusually long incubation period the disease was characterized by fever, frontal headache, and myalgia. Aureomycin therapy failed to eliminate the bacteremia. The similarity of mild leptospirosis to la grippe is noted.

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A Division of Nursing, with Margaret Arnstein, a career nurse officer as chief, merges the former Division of Public Health Nursing and the Division of Nursing Resources. The new Division of Dental Public Health and Resources, headed by Dr. Donald J. Galagan, a career dental officer, combines the Division of Dental Public Health and the Division of Dental Resources.

# LEPTOSPIRA POMONA INFECTION

## IN A WOODCHUCK PRELIMINARY REPORT

In an epizootiological study of leptospirosis and brucellosis in cattle and wildlife in Chester County, Pa., *Leptospira pomona* was isolated from a southeastern woodchuck, *Marmota monax monax* (1). This was the first time *L. pomona* had been isolated from this species in the United States. Infection with *L. pomona* is common among cattle in southeastern Pennsylvania.

### Materials and Methods

Kidney and urine specimens were removed aseptically. The kidney was ground with mortar and pestle and a 10 percent by volume suspension was made with Stuart's base liquid medium (Difco). The following media were employed: Fletcher's semisolid medium (Difco) containing 10 percent rabbit serum; Fletcher's semisolid medium containing 15 percent horse serum; Chang's semisolid medium (2), Hamilton, Mont., modification (3), containing 10 percent rabbit serum; Chang's semisolid medium containing 15 percent horse serum; and Stuart's semisolid medium (4) containing 10 percent rabbit serum. One set of media tubes was inoculated with 2-3 drops of kidney suspension and one set was inoculated with 1-2 drops of urine. Serial tenfold dilutions of kidney suspension were then made, with Stuart's base liquid medium, to approximate  $10^{-2}$ ,  $10^{-3}$ , and  $10^{-4}$  final dilutions. A 0.1-cc. inoculum of each of these dilutions was streaked on petri plates containing 30-35 cc. of Cox's (5) plate medium. Tubes and plates were in-

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cubated at 29° C. and examined at 7- to 10-day intervals. As the woodchuck was dead when delivered to our laboratory, it was not possible to determine the level of serum antibody.

### Results

Growth of *L. pomona* was detected on the 14th day postinoculation. Organisms were present in one tube of Fletcher's semisolid medium with 10 percent rabbit serum inoculated with kidney tissue and in Fletcher's semisolid medium with 15 percent horse serum and Chang's semisolid medium with 10 percent rabbit serum inoculated with urine. Transfers of organisms were made into Fletcher's semisolid medium with 10 percent rabbit serum and subcultures were made at 30- to 40-day intervals. Cultures were sent to the WHO Reference Laboratory for Leptospirosis, Walter Reed Army Institute of Research, Walter Reed Army Medical Center, Washington, D.C., for typing, where the organisms were identified as *L. pomona*.

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# WEB OF MUTUAL ANTICIPATIONS

## CONFERENCE REPORT

The dynamics of education for health, theme of the 1960 Eastern States Health Education Conference at the New York Academy of Medicine, April 28 and 29, deliberately distinguished between health education and education for health.

From the opening remarks by the conference chairman, Dr. Duncan W. Clark, State University of New York, to the summary by Dr. Iago Galdston, The New York Academy of Medicine, the discussions dwelt on the value of self-conscious consideration of communication as art or science, in both general and specific terms, as a phase of the social process. Most of the speakers were sociologists.

Quoting the observation of Joseph Coiffman of Holyoke, Mass., that "the greatest barrier to communication is the illusion that it has been achieved," Dr. Galdston stated the goals for the conference: first, to outline the complex phenomena of communication in relation to learning; second, to relate the techniques of

communication to public health needs; and, finally, to show how changing technologies affect both communications and health programs.

### Research Opportunities

Following references by Dr. Galdston to such aspects of communication as linguistics, semantics, subliminal imprinting, and nonverbal communication, Prof. John W. Riley, Jr., explained why a simple model of communication, "who says what, in what channels, to whom with what effect," needs to be modified into something like "a network of mutual expectations which binds together social entities."

As an example of the unanticipated consequences of communication, he mentioned a survey during the last New York newspaper strike, which concluded that most people bought papers not for information but to achieve "a sense of security in a disturbed world."

Similar findings were reported with respect

## *The Public Be Informed!*

There is a distinction between publicity and reporting which I find is often completely unappreciated by scientists and businessmen alike. I am sure that the public relations people and reporters themselves are keenly aware of the difference. The reporter, the science writer, usually a full-time member of a press association or a newspaper staff, has a duty to be skeptical, questioning, inquiring, and to ferret out the hidden motives, the greed, the inconsistencies, and the purposefully or inadvertently slanted viewpoints. His is a service to the public. The person engaging in public relations is, on the other hand, hired by and answerable to a concern or a person who wants to get something into public print. He may work for an advertising agency, or he may work directly for a corporation, or, in these enlightened days, for research laboratories and scientific institutions.

Most of the public relations people have the high qualifications and, within their framework, the ethics of the best science writers. Many of them, of course, have been science writers and reporters for newspapers, and they have come into the work of public relations through that avenue. But it is important to realize that they are working for a person or institution that wants to get something into the newspapers. If their employers want something in the papers, it is the job of the public relations person to do his best to get it in, whether he is wholeheartedly in favor of it or not. That is his job. So you see that a person doing publicity must operate in a somewhat different way with different criteria from the science writers who are primarily interested in the way in which the public is informed.

If more scientists understood this distinction, recognized it, and applauded it, we would undoubtedly have better reporting of science. Strangely, the same scientists who would be appalled at slanting research results often assume that anybody who is writing for newspapers, particularly when handling their research reports, should take a public relations attitude toward them. This distinction between publicity and reporting is extremely important, and scientists should be reminded periodically.

I do not mean to imply that public relations efforts should not be undertaken or that the press agents, as they used to be called, do not serve a useful function.

The superior financial reward that comes to those who do publicity rather than reporting should be a matter of concern to those interested in the distribution of scientific information and opinion to the public through mass media. Repeatedly, those who have become experts in science writing and reporting cannot resist the temptation of considerably higher salaries obtainable from those who wish to have adequate public relations efforts.

Not all of the science writers are happier in writing for direct publication itself, through newspapers, magazines, and the like, but I believe most of them would prefer to do this than to do public relations. The deterrent to holding many of the best of the science writers in actual writing for newspapers and magazines is often the salary differential.

Another concern in the training, raising, nurturing, and feeding of science writers, particularly those who are beginning, consists of very different criteria for science writing than some of us, some four decades ago, hoped might exist. The plain fact is that many science writers now just do not know anything fundamentally about science, or at least they did not when they started in. I have had the conviction that a good science writer ought to be a hybrid, part scientist and part newspaperman, and to achieve this effective blend, it would be better to start off as a scientist of sorts rather than as a newspaper person. While many of the judgments of the good reporter are those of a good research person, that is, both must assay facts, draw conclusions, and have high integrity and a willingness to recede from preconceived notions, nevertheless in practice the research method is somewhat different, although not fundamentally, from the journalistic method. Every person who expects to make science writing a career really should get his hands dirty and his mind disturbed in some sort of a research laboratory.—*Excerpt from an address by Watson Davis, director, Science Service, when accepting the James T. Grady Medal for excellence in science writing, presented by the American Chemical Society, Cleveland, Ohio, April 7, 1960.*

also for a change of pace, so that slow movers may be picked up after they have been passed by in early stages. For example, an immunization campaign might succeed in bringing half the population into a clinic on the first announcement, but other sustained and paced methods will be needed to immunize the others. While the rapid processing unit may move on to another center, personal visits or telephone calls may be applied to complete the program.

By anticipating tension and resistance in the slow movers, he said, the agency can learn the nature of the resistance and deal with it. If the objective is to persuade young people not to smoke, Krugman suggested it is useful to know that they regard smoking as a mark of adult behavior, as an exciting element of living, and as a minor hazard which, in their judgment, will surely be overcome by scientific advances.

### Resistance

Resistance, he said, is seldom open or direct, but rather an uneasy and defensive conflict, with more variations than there are human beings. In effect, he said, the technique of overcoming resistance remains an art, rather than a science.

The personal aspect of communication, the bridge between the mass message and specific action, Krugman stated, is the most difficult to effect, most crucial, and most in need of evaluation during an operation, so that the word-of-mouth response may be effectively observed.

The models described by the other speakers as a skeleton of discussion were complicated further by Dr. Robert O. Carlson, communications research adviser to Standard Oil Company (N.J.). Distinguishing between the committed audience and the uncommitted audience, he devoted most of his attention to the image which the audience has of the public health agency. This image, he said, may account for resistance among the uncommitted.

Communication with a committed audience, such as a gathering of campaign workers, has the value, he said, of reinforcing established values or information. Its challenges are mild compared with those of the uncommitted who if not openly hostile are probably apathetic to the message.

### The Uncommitted Audience

Typically, he said, the uncommitted audience considers a health agency as interested only in the poor. It endows the health agency with a "welfare halo," seeing it as a symbol of authority, as a patronizing force, impersonally concerned with statistical measurement rather than with human beings. It is usual for the uncommitted audience to believe that the health agency is "simply trying to scare the people." Or the audience may respond indifferently to the message, saying, "I know it already," or "It's too technical for me." The audience may feel the health agency is intruding on personal affairs or engaging in a fund-raising racket. The resistance may be based on simple xenophobia: "I don't know you: go away." Whether or not these aspects of resistance are superficial or rationalizations, Carlson considers them typical.

On the other hand, the uncommitted audience is impressed by a message from a source respected by the leader of the primary group. But it will not swallow a statement in conflict with its expectations from that source: it would be dubious of a health officer's endorsement of a beauty cream. Credibility is influenced by the image of the source as an expert on values or as an expert on facts or technology. The city engineer might be heeded with respect to the quantities of water required by a city, but not for his opinion on health insurance.

The motives of the source of information are always questioned, but openly acknowledged self-interest, Carlson noted, is usually disarming, as in the case of the successful candidate for office who freely admitted he wanted the job because he needed the money. It is better for motives to be explicit, he said, than hidden.

Essential to the success of a message, said Carlson, is a set of common values. No communication will succeed if the audience and the source have no common ground to stand on.

Equally essential, he said, is the need for deeds to be congruent with words, as when the Surgeon General led off an immunization program by inoculating his own children.

### The Self Image

The image of self, said Carlson, is as important in behavior as the image of the source



to the audiences of daytime radio and TV serials.

The tendency for people to hear only what they wish to hear, Riley said, was illustrated by evidence that so many who attended lectures or films on the dangers of inflation already knew the message.

Other evidence of this tendency, he said, is found in studies of perception: for example, one found that poor children always overestimate the size of coins.

Riley also reported that children who are accepted by their peers usually have little difficulty in absorbing traumatic experiences: it is the children who feel they do not belong who act out their feelings.

The major determination in the field of communication, he reported, is that individual behavior and opinion seem to be shaped above all by membership in a primary group, often a neighborhood. What will the neighbors think, appears to be the strongest single influence.

The public, Riley observed, is not an anonymous aggregate of unrelated individuals but a mosaic of interlocking social units, with key figures in each setting the pattern for their peers.

Professor Riley primarily stressed the need to think objectively about communications and to study the phenomena.

Categorically, he recommended research in the social processes of communication, with studies of perception, reference groups, primary groups, and small groups.

### Knowledge for What?

Dr. Herbert E. Krugman, director of market research for Raymond Loewy Associates, described studies of communication which likened a message to the infectious agent in the classical epidemiological setting of host, agent, and environment. Among studies conducted with reference to psychological warfare, efforts were directed at learning how long it takes before a message dropped from a plane becomes a topic of conversation in enemy territory. Another experiment was aimed at appraising the public mood simply by reporting random remarks heard in the pubs and markets of England.

As a result of market research, he explained,

most commercial advertising is directed not at selling a product but at selling a convenience or service, or at some other interest of the audience: specific information about the product per se is usually the last thing the consumer evaluates, he indicated.

In this connection, he raised an ethical issue with respect to the fetish of being well informed. Under the spell of certain advertising, Krugman said, people tend to assume they have fulfilled a civic responsibility simply by coming into possession of a wealth of facts; they feel no duty to act upon the information. Information itself, he stressed, is not enough. It may be a handicap to action if informed people lose a sense of guilt for not acting.

Krugman then described a model developed at the University of Michigan in a study to trace the relation between action and channels of information. Five stages of public response, defined as awareness, interests, evaluation, trial, and adoption, were related to the source of information at that stage. As might be expected, the mass media, predominantly newspapers and broadcasting, were mentioned most prominently at the stage of awareness, but even then by only about half of the respondents. The emphasis on mass media thereafter declined until at the stage of adoption they were not mentioned at all.

### Mass Media

The secondary effect of the mass media as an influence on the key persons who provided the final influences was a complicating factor in this model. Krugman concluded there is no priority among the types of communications used. Each is appropriate to its own function. Strong publicity, he said, cannot compensate for a weak field service, and a field service is not fully effective without publicity.

The first persons to respond to a message, Krugman emphasized, are the most important to the program. Failure to deal with them properly at this stage, he said, handicaps a program at the outset. He strongly endorsed field trials as a basis for preparing techniques for mass application.

The phasing of a program, he said, should allow not only for the tactical use of media but

with the recreational and aesthetic values of the open stream. Even a common language employed by both the professional and the public does not guarantee a common purpose.

The relevance of a program, he suggested, is indicated by its consistency with the prevailing mode of possibilities. For example, he said, if a heart patient lives on the third floor of a walkup tenement, it is congruent to advise against climbing stairs, but it is not relevant. Even if the need is understood, the application of prescribed action may be irrelevant. For example, the urban environment, he said, is ill suited to the usual recommendations for the wise use of leisure time.

The quality of a program's evaluation, Makover said, is determined by the feedback of relevant information. In this connection, he deplored the personnel shortages which encourage a physician to seek a diagnosis by the "laying on of hands" and from laboratory reports, rather than undertake a careful solicitation of history. He asked why it is that the sound of a heart, heard through a stethoscope, is considered more scientific than the sounds that issue from the mouth.

He cited the highway safety program as an example of congruence, with good evaluation, but a deplorable lack of relevance, since speed and social status command a higher premium than safety.

### Ecology

With a glance at the past achievements in public health as an inspiration to the future, Dr. Wilson G. Smillie, professor emeritus of Cornell University, reminded his audience that many great leaders of public health movements in the 19th century were not trained in the health professions but were lay figures such as Dorothea Lynde Dix, Lemuel Shattuck, Florence Nightingale, Nathan Straus, and Edwin Chadwick.

Their prominence, he suggested, indicated a vigorous public knowledge of and interest in health issues related to free communication between the professions and the public.

Following a further historical review of the changing and expanding character of public

health presented by Dr. George Rosen, professor of health education, Columbia University, Dr. Jay Tepperman, professor of experimental medicine, State University of New York, Syracuse, discussed the nature of health needs of the present era. Whereas the bacteriological developments in public health, following development of the achromatic microscope, presented a fairly simple model of action, Tepperman pointed out that the health needs of modern times are complicated by a mosaic of factors: genetic, environmental, nutritional, psychological, social, dietary, economic, cultural, and even religious.

As Rosen said in his presentation, the concept of public health was narrowed by the specificity of the germ theory, but broadened again as the human element and the socioeconomic forces came into focus, so that the attempt today is to see public health from the point of view of the ecologist.

Citing Pasteur as personifying the specific approach on the one hand and Bernard as the holistic or physiological approach on the other, Tepperman proceeded to discuss the role of the experimental animal in the collection and dissemination of information pertinent to health.

### Lesson of the Rat

Whereas acute infections are vulnerable to any attack which breaks the life cycle of the specific agent, he observed that the chronic diseases are not so readily understood or controlled, being generally multifactorial, that is, associated with a mosaic of influences. It is seldom clear that one plan or another will bring an anticipated result. This condition is not only perplexing to the scientist but even more confusing to the journalist and the general reader, because so little valid information about physiology can be conveyed in a headline or a radio bulletin.

Although it is not easy to learn the nature of physiology even in general terms, Tepperman said, public understanding of the individual role in relation to chronic diseases can be achieved in no other way. It is only unfortunate, he commented, that some of the solutions of our present health problems will not necessarily come in bottles.

of information. Dr. Edward A. Suchman, director of social science activities for the New York City Health Department, commented that the self-image bears especially upon health educators and others engaged in public communications. If instead of analyzing a situation objectively, a person fits events into a conception of his own role, his behavior becomes routinized and ritualistic rather than rational.

Such behavior, he said, is not a product of conformity or a symptom of a lack of imagination, but the end product of a process of socialization. Along with other speakers, Suchman referred to the oft-quoted remark of Samuel Darling, "to learn how to control malaria, you have to think like a mosquito."

Because of the tendency to conform to a self-imposed pattern, Suchman remarked that 95 percent of the presidential vote in some groups is predictable. This identification with the primary group, and acceptance of its mission, he added, rather than an intellectual grasp of the issues, was the deciding factor in the fighting spirit of the Armed Forces during the war.

Conversely, prejudiced persons do not see themselves as bigots, he said, and for this reason messages of liberalism are dismissed as inapplicable by those most in need of it.

Seeing herself as a good mother, he added, a woman takes her child to be vaccinated, not because she understands the risks and percentages of protection, but because that is what good mothers do.

### Basic Rules

Four sociological rules were put forth by Suchman in summation.

First, he dwelt on the point that there is no single public, but a four-dimensional mosaic of many groups with differing characteristics. When a message helps an individual to identify himself with a group to which he feels attached, Suchman said, it is easier to deal with the individual. The differences among groups which influence behavior were illustrated by his observing that 60 percent of working class mothers, according to one study, fed children at the breast, whereas only 25 percent of middle class mothers followed the practice, at that time. (Since then, he conceded, fashions may have changed.)

Second, he emphasized that the message itself is only a small factor in the total system of communications, as indicated by the many cultural and physical influences which bear on behavior. Any communication will be fitted into an already existing group definition of the situation.

Third, he stated that there is seldom a consistency between the facts on the one hand and attitudes or behavior on the other, or between attitudes and behavior. Eating habits, for example, may be determined by medical advice, kitchen facilities, or finances, rather than by attitudes. Whatever may be the relevant scientific facts, he said, attitudes are determined by emotions and custom, and behavior is governed by legality, environment, and habit.

Fourth, while it is seldom possible for a message to reach the bulk of a population directly, Suchman said, the masses can be reached through their leaders. While most people are psychologically deaf to a scientific message, they tend to go along with leaders who look at the facts, listen to the arguments, and pass on their conclusions. These gatekeepers of the channels of communication often may be reached through mass media, he said, but it is always important to know who they are and how to reach them.

Dr. Henry B. Makover, professor of preventive medicine, Albert Einstein College of Medicine, endeavored to analyze the deficiencies in public health practice relative to communications.

While it seems self-evident that public health agencies have the information to improve conditions, he said, their campaigns are sometimes misguided, wasteful, or even destructive. First of all, he said, the objectives of a program must be clear to the professions and desirable to the public, and such conditions are not readily fulfilled.

### Criteria

Makover suggested that health programs might be appraised for congruence, relevance, and evaluation. By congruence, he implied the quality of mutuality of purpose between the profession and the community. The profession which is concerned wholly with the presence of pathogens in water, for example, is not congruent with a public which, he said, is concerned

# The Elements of Health Education in Good Public Health Programs

GRANVILLE W. LARIMORE, M.D.

**A**S THEMES, the elements of a good public health education program, or what public health education can contribute to a good public health program, are fields of discussion which have been virtually tilled to exhaustion. In contrast, our colleagues in Pennsylvania have taken a completely fresh approach. Instead of looking at public health through the eyes of health education, they have proposed to turn around and examine health education from the broad perspective of public health.

Yet another aspect of this approach is the assumption that a good public health program does have at least some elements of education built into it. This assumption is one about which I hope there will be little controversy.

The objective of any good public health program is a favorable effect on the health status of the citizens of a community, whether that community is a municipality, a State, a nation or, for that matter, the world. Such an objective, by its nature, implies change, except in rare circumstances when perfection is to be maintained. Almost without exception, accomplishing this objective requires some intended changes of attitude and behavior among those affected. This premise applies as much to yaws control deep in Africa as to our own efforts to vaccinate against poliomyelitis.

Since an intentional change of attitudes, beliefs, and behavior is, I believe admittedly, inherent in a good public health program, we may

then ask, what process is chiefly instrumental in bringing this about? Through the techniques of education, which include study, communication, and demonstration, we seek to impart health information and at the same time motivate the individual to use that information for the protection of his health.

To see this process for what it is and to improve it is the hope of every director of public health.

Most of us in public health have some familiarity with educational principles; either through formal training or from day-to-day experience. I suspect that there is hardly a public health program launched today which does not at least give lip service to "public health education."

But how many programs allow for the thought, the time, and the facilities for their educational phase? How many introduce the educational function at the beginning and keep it bound to the core of the program until the end? Is there a seat at the table for this function at the first planning session? Is it occupied by someone especially qualified by experience and training, with knowledge of the program both at the giving and receiving end, with sense and judgment in the realm of science, the social sciences, and public health practice, with skills in communication and organization? Although education is a function shared by all members of a health agency, wise health directors, when they can, employ the services of a specialist in this function, even as they employ specialists in pathology, nursing, engineering, and statistics.

Especially with respect to short-term pro-

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*Dr. Larimore is deputy commissioner, New York State Department of Health, Albany. This paper is based on an address at the 1958 Pennsylvania Health Conference.*

The experimental animal, he said, has helped to explain both to the clinician and the theoretician the interplay of the variables in complex biological processes. To illustrate, he described some of his own work with respect to coronary occlusions.

Although epidemiological studies of bus drivers and conductors and of postmen and male telephone operators, he said, have indicated that active workers are less likely to suffer coronary attacks than sedentary workers, there were no satisfactory physiological data to explain this phenomenon. In an effort to discover how exercise affected the heart, Tepperman divided a group of homogeneous rats into two categories. One lot was encouraged to swim for 1 hour each day, with special efforts to activate floaters and piggyback riders. The other lot, under identical housing and feeding conditions, was permitted to rest.

The physiological effects of this experiment were revealed as Tepperman next showed a few slides depicting a technique, critical to the experiment, for measuring the diameter of the coronary vessels in the respective rat groups. A liquid red plastic compound was injected into each rat's beating heart so that the fluid was pumped through the entire coronary system. There it hardened. When the meat of the heart was removed in an alkaline solution, the plastic residue formed an exquisite model of the blood vessels. These models then were measured in relation to the mass of the heart.

In the swimming rats, the coronary artery network was found to be consistently of higher volumetric ratio to the mass of heart muscle than in nonswimmers. Also, the collateral branching of the coronary artery network was larger and more elaborate. Although the rats which had been encouraged to swim developed, during the experimental period, massively larger hearts, their heart-bulk regressed if they were allowed to rest a given period before sacrifice. But after the resting period, the coronary artery network of the exercised rat retained a higher volumetric ratio to its muscle bulk.

While exercise is only one item in the complex which includes diet, emotional stress, smoking habits, endocrine activity, and geographical position among other factors, the experiment

demonstrated a mechanism which may relate exercise to a low incidence of coronary occlusion.

For the purpose of the conference, which was not primarily concerned with heart disease, the chairman observed that Dr. Tepperman also demonstrated a method of communicating effectively, by using narrative with humor, visual aids, and real events described in concrete terms.

### **An Obligation and a Right**

Speaking at the dinner meeting, Dr. John D. Porterfield, Deputy Surgeon General, Public Health Service, laid to limited resources of manpower and other health facilities the failure of health workers to utilize available knowledge. While some of the lag between knowledge and its application is unavoidable, he said, and some even desirable, he felt that behind the failure to obtain support for health programs was a deficiency in public education. There can be little doubt, he said, that we have largely failed to convey to the public the enormous returns on its rather modest investment in health. Stressing that the public health agency is accountable for its actions, he added that there is both an obligation and a right to improve public knowledge of health services, so that the public may form wise decisions.

Porterfield challenged the profession to be both bold and flexible in utilizing the media of communications, but also to be mindful of limitations of the mass media in dealing with complex issues and of the limitations of the behavioral sciences in guiding a course of administrative action. In support of an aggressive strategy, he reminded his audience that the successes of the past were won because the leaders saw clearly what they wished to accomplish and they enlisted public support in the fight for health. This determination and vision, coupled with an ability to speak and write with words the public understands, Porterfield suggested, was not a magic formula, but certainly desirable.

Full text of the conference talks and discussions will be published by the New York Academy of Medicine.

ment provides a strong motivating force in changing attitudes and influencing behavior. Where one's work goes, so does one's interest. Given a fortunate experience, the volunteer learns the meaning and value of a program and becomes a staunch advocate and supporter. If his experience is unfortunate, of course, he may turn the more violently against it.

Finally, may we mention, not specifically as an element of the health education process but of prime importance nonetheless, one other factor. That is, the factor of "timing." We have already referred indirectly to timing in the sequential development of the communications process; now may we speak of it with respect to the community. It has been our observation that many public health programs have failed because of poor timing. Not only in the sense that the community was not yet ready for the program, but more particularly in the sense that timing is in itself important in the educational process.

For example, health agencies sometimes exhibit an unhappy tendency to move too fast in carrying out programs which require active participation on the part of individuals in the community. It appears quite clear that there is as definite an "incubation period" with respect to the lag between the time the community is informed and the community acts as there is between the time of exposure to a disease and the development of the first symptoms.

Even as this incubation period varies with individual diseases, so does it vary with different public health programs. It is to be noted that, for some diseases, this period is quite short. Similarly, in a real health emergency, we are all sometimes surprised how quickly a community becomes informed and how rapidly it responds. In general, however, there is a lag of weeks or even months between the informational and action phases of a public health program. Without proper timing of information in relation to action, the best laid public health programs go awry.

How fast one may move depends on the nature of the program, the size of the community, the structure of the community, and a number of other factors. The final decision as to timing must in the last analysis depend on judgment based in turn upon experience, a

thorough knowledge of the factors involved, and a sensitive feeling for the responses of the public in each specific situation.

### Summary

In summary, these assumptions are proposed for a working hypothesis:

1. That education of the staff, community leaders, and the public is essential to effective public health programs.

2. That public health programs are most likely to succeed to the extent that education is brought into the planning early and to the extent the specialists in education participate in the program planning.

3. That among the elements of education in a good public health program are (a) free and thorough communications, first within the agency itself and then with the individuals and groups especially affected or to be reached by the program; (b) detailed attention to the information process to the end that, when desirable, the community at large is informed through suitable mass media; (c) involvement of individuals in the community through the medium of the many social units which make up the general public.

4. That appreciation of the importance of timing will allow for a proper incubation period from the moment of the first information about the program until the hour for action.

### Referee's Comments

In the past, there has been some controversy on the point that a health education program seeks "to motivate the individual . . . for the protection of his health." This controversy may be based on imaginary grounds.

It is possible to imagine an all-powerful government using base techniques to influence public behavior in a direction which its bureaucrats fondly believe is all for the best. It is not difficult to cite examples of governmental propaganda which, deliberately or not, has led a public to its own destruction.

On the other hand, it is almost impossible to conceive of a program of information which does not in one way or another imply an effort at motivation. If there were no effort at motivation, there would be no information.

grams, successful programs rely on three elements of education. The first is communication.

Many public health programs have faltered through neglect of communications. Sometimes the staff themselves are ill-informed about the program, its objectives, and how it is to be carried out. It is not unusual for staff members to say, "I don't know anything about it; I just work here; nobody ever tells me anything." The remark, often passed half in jest, half in bitterness, reflects a breakdown of communications that can easily be met by meetings and written outlines. In some agencies, it is met in the process of preparing program descriptions and progress reports by staff members.

From this beginning, the chain of communication extends to all others directly concerned. Depending on the nature of the program, they include key people in institutions and organizations, such as voluntary and official health agencies, professional societies such as those of medicine, nursing, and engineering, the schools, and civic groups. It is a truism that public information is meant not for a single audience but for a mosaic of audiences. There is really not a "general" public, but many smaller "individual" publics.

Communications with these audiences, however complete and thorough, are successful to the degree that they are arranged to reach the respective audiences in proper sequence and at an effective time. In a poliomyelitis vaccination program, for example, communications are timed to reach physicians before they do lay groups, and they may go to medical leaders before they go to the medical society as a whole. By such means, understanding and cooperation may develop systematically.

The communications process has its genesis in the joint planning that accompanies the development of any public health program. Properly carried out, such joint planning brings to the conference table representation from all the groups who will have an active role in the program, as well as those who will be reached by the program. These conferences are in themselves a phase of communication, which is by definition a two-way flow of information.

The second element of education is the substance of the "information" itself, especially that which goes out rather than what comes in.

If it be desired that the maximum number of individuals in the community learn about the program, the need for it, and the reasons for the course of action recommended, the most practical course is to supply the facts through newspapers, radio, television, and other mass media. The technique applies when it is desirable to disseminate information about the program accurately, quickly, and to the largest audience possible.

The third element, supplementing communication to the general public, seeks participation of a multitude of social units. This element is usually called *community organization*. These social units each have their own core: a neighborhood, a church, a lodge, a profession, trade, business, or civic interest, a school, ethnic background, a sporting interest, a hobby, or a cause. The specialist studies the community's structure to search out these discrete groups and their organizational structure, so as to develop effective lines of communication with their members. In so doing, the information process extends from the mass media to a specialized and personal relation with each group.

It is an axiom that the mere possession or transmission of information is not the ultimate objective. Information, unless acted upon, is of only academic interest. From the efforts to put information to use comes the term "*community involvement*," expressive of the aim actually to involve social units and their members in the program.

Why is involvement an essential element of the process of education? First, it is generally accepted that involvement in the learning process strengthens that process. Second, involvement provides a motivating force. For example, when an organization devotes a meeting to a discussion of a health program, considers all aspects of it, pro and con, and takes a position on it, each member of the group becomes involved by being identified with the experience, reviewing the information, and assuming some emotional relation to the position voted. He is the more likely to develop an attitude or a course of behavior suggested by the unit than by independent experience.

Involvement may also take the form of volunteer service, in which members of the group assist with the program. Again, such involve-



# IMMUNOFLUORESCENCE

ALBERT H. COONS, M.D.

IT IS a high honor to be invited to deliver the R. E. Dyer Lecture. Dr. Dyer was actively studying rickettsiae when I was still a college student. Tonight he sits among us in the midst of this galaxy of institutes of which he was the first director and the initial guiding force. We are all here to do him honor and I know we are all joined in wishing him many more happy anniversaries.

Such an occasion is both a challenge and a responsibility to the lecturer, and I feel humble under its weight. Up to the present, my activities have been increasingly specialized, so that there is little choice in the subjects of which I can claim sufficient expert knowledge to justify your coming to listen. I am a musician with a single tune; when I am called upon to sing, I must hope that the audience is new because, alas, the song is not. However, the subject of immunofluorescence is not out of place in this environment. Indeed both the cellular aspects of immune reactions and the specific identification of pathogens in smears are matters not only of obvious interest but of active advance within the Public Health Service. The fact is that, although my colleagues and I had a hand in introducing fluorescent antibodies as useful immunological reagents, the largest and most

active group now working with them is at the Communicable Disease Center of the Public Health Service at Atlanta, Ga.

Fluorescent antibodies, whatever their scientific merits, are very attractive under the microscope. They shine in the dark, a brilliant greenish-yellow glow. Like pebbles in the moonlight, they weave a pattern in the forest which leads the weary children home.

In the space of an evening it is not possible to describe in detail the multiplying examples of the application of these labeled antibody molecules to the many special problems of infectious disease. Rather, I propose to describe briefly what fluorescent antibodies are and then to single out examples of their use: the specific identification of a virus and a bacterium in a diagnostic situation; the study of tissue cells infected with a virus; and the synthesis of antibody in cells.

Antibody molecules are proteins synthesized by cells apparently specialized for that process, and then secreted into the circulation, where they persist for a few weeks in gradually diminishing amounts. Their half-life in man is about 13 days, and in the animal most favored by immunologists, the rabbit, about 5 days (1). The special property which makes them objects of intense current interest is their possession, as structural features, of two specific reactive areas, apparently concave. They are complementary to and fit more or less snugly around molecular configurations projecting from the antigen molecule which stimulated their synthesis in the first place (2,3). These comple-

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*Dr. Coons, a career investigator of the American Heart Association and visiting professor of bacteriology and immunology at Harvard Medical School, delivered this lecture December 1, 1959, at the National Institutes of Health, Public Health Service.*



The controversy therefore relates not to the existence of efforts to motivate society but to the nature of such efforts. However noble and altruistic the intent may be, it appears arrogant to assume a personal responsibility for seeing that others behave properly. Such arrogance, even as exercised by parents toward their children, arouses resentment and distrust. The question is, how can a health agency exercise responsibility without such arrogance?

An unemotional statement of the facts is as a rule an unimpeachable course. It is the course most public agencies seek to pursue, whether accounting to the public for their own expenditures, or advising the public of important news.

It may be argued that the facts on fluoridation, by themselves, have not always succeeded in overcoming emotional opposition. In such situations have public agencies fulfilled their responsibility? It may also be argued that the facts have seldom been presented so as to overcome legitimate doubts among the majority: the issue was permitted to be political rather than scientific.

An even more perplexing shortcoming in reliance upon simple fact concerns programs of radiation safety. In the absence of completely valid information which, for the moment, may decide the public course on a scientific basis, the issue of radioactive contamination has become almost wholly political. In this situation, how can unemotional information fulfill the health profession's responsibility? Is it sufficient to supplement unemotional fact with cold logic?

There is no intention here to claim that public behavior is on the whole determined either by facts or logic. Most behavior appears to be imitative and repetitive, or intuitive. Or it is influenced by a system of rewards and punishments, real or illusory. With such a pattern of public behavior, does a health agency abdicate responsibility when it confines education to fact and logic?

The escape from this corner appears to be an assumption that community leaders are influenced by fact and logic in a climate of knowledge and understanding, where their behavior may be understood to be rational. It may be further assumed that the response of the public, the mosaic of small publics, is to follow the leaders, even as children are more impressed by the example of their parents than by what their parents may tell them to do. The mass media, as noted above, are essential to creating a climate of knowledge and understanding: personal involvement will complete the work of fact and logic to suggest a course of action for the community leader.

The course may not be the course which the health profession looked for, but it will be one democratically determined by enlightened citizens.

Nobody deprecates legitimate efforts to bring facts and logic to public attention: the use of Monday datelines on press releases, colored ink, and eye-appealing layout and design of educational materials are all as legitimate in the tradition of communication as the Roman alphabet. The technique of presentation goes false, it seems, when logic is distorted, when irrelevant motives are abused, or when the facts themselves are twisted.

In the contemporary code of ethics, there seem to be no barriers to the half-truth, to the appeal to fear, libido, or status imagery; to the deadening of common sense by an inane repetition of a name or a slogan. But the resort to these devices in itself frustrates the objective of health. The healthy body implies a healthy mind. And a healthy mind is one that works, not one that is clouded with lies, base motives, or associations empty of meaning or value. For this reason, the techniques of motivation in a health program should tend to police themselves. And the controversy over the health agency's role in influencing behavior proves indeed to be imaginary.

antibody solution and components in the tissue section.

### Identification of Virus and Bacteria

As an example of the result of a search with specific labeled antiserum for cells infected with a virus, I refer to a portion of a microscopic preparation photographed by my former colleague, Dr. Chien Liu (16, fig. 1). The photograph shows 10 or so cells lining the nasal cavity of a ferret. These are typical columnar epithelial cells, with one end along the basement membrane, and the other ciliated end forming the wall of the nasal cavity. The four blue-gray cells at the top show the normal fluorescence of tissue cells in frozen section; those below show yellow-green fluorescent patches where labeled antibody has reacted with antigen in the cells. In this case, the antiserum was prepared in rabbits against the A strain of influenza virus, and aggregations of viral antigen are revealed both in the cytoplasm and the nucleus of infected cells. At the time this ferret was killed, on the third day of an experimental infection, the infection in this particular spot was demonstrable in a group of cells, but not in the contiguous ones. Moreover, there is a considerable amount of cytological detail visible; heavy amounts of antigen along outer cell walls, patches in the cytoplasm, and surprising amounts of what Liu proved to be S antigen in the nuclei. Other examples of antibody deposited over collections of antigen in infected cells are mumps virus in the acinar cells of the parotid of an infected monkey (17), vaccinia virus in F-J cells (18), and herpes simplex virus in its early stages in F-J cells (19).

To mention two more examples, Liu (20) has been able to make accurate diagnoses of influenza A in three-quarters of the cases in a small series by the examination of smears from a single nasal washing each, although the results with an outbreak of influenza B were less accurate, and Goldwasser and Kissling (21) have demonstrated rabies virus in Negri bodies and in brains known to contain virus in which no Negri bodies could be found. They have also found rabies antigen in the salivary glands of infected dogs, foxes, and other species. There seems little question that for some virus dis-

eases the use of labeled antibody will become the diagnostic method of choice.

An illustrative example of the diagnosis of a bacterial disease is provided by the data of Moody and Winter (22) for a case of experimental *Pasteurella pestis* infection in mice, where organisms were specifically identifiable in impression smears of the spleen for a few hours after infection. Many other organisms have been investigated in a preliminary way, and it is already clear that in the cases where the serologic relationships have previously been established, specific diagnoses can be made in material containing only a few organisms. However, unexpected situations arise. For example, Thomason, Cherry, and Edwards (23) found among Enterobacteriaceae in the intestinal tract of man and animals many organisms having serologic relationships to *Salmonella* serotypes. Smears of feces contained many reacting organisms which were not the *Salmonella typhi* sought. Moreover, Thomason and her co-workers found that normal rabbit serum often contained nonagglutinating antibodies reactive with *Escherichia coli* and with *Proteus*, thereby producing false positive reactions when the animals were subsequently used in the preparation of a specific antiserum.

Clearly, marked antibodies are of great potential interest in the diagnosis of viral (Liu), protozoal (Goldman, 24), and bacterial (Moody) diseases because they offer the possibility of specific identification without waiting for pure cultures or large numbers of the organisms. It is, I think, equally clear that a considerable amount of developmental work will be necessary before they are useful in the practical diagnosis of a specific infection. In the course of such developmental work it is almost certain that new information concerning the distribution of antigenic determinants and the surface structure of bacteria will be uncovered, and those who are engaged in these tasks should be alert for these dividends. Moreover, it is likely that viruses masked as completely as were the adenoviruses which we carry in our tonsils will come to light as tissue is exposed to interaction with serum from various sources. The history of immunology is largely bound up with the exploitation of such circular situations, where convalescent serum reacts with the organism

mentary patches account for the specific interactions between the antigen and the antibody. For reasons not understood, the patches on a given antibody molecule apparently react with the same antigen molecule, and perhaps always with the same configuration, not with a different one. Since such antibodies appear in any appreciable amount only after exposure of the cells to the antigen, the mechanism of their synthesis is a fascinating and unsolved problem. I will come back to this later.

Meantime, regardless of the details of the method by which antibodies are synthesized in such exquisite complementary form, their specificity can be harnessed as a tool. The history of immunology is largely that of the utilization of antibodies, produced by systematic injection of an antigen into animals, for various specific purposes. Making them fluorescent is simply another variation of their use as reagents for the identification of specific antigen, whether it be vaccinia virus or hen's ovalbumin.

### Fluorescent Antibodies

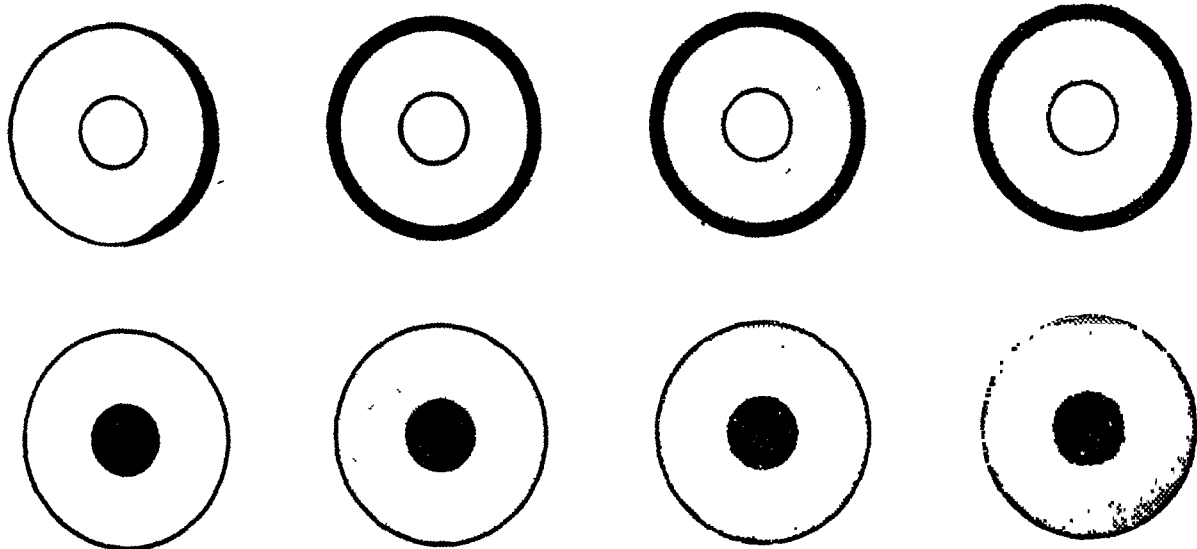
Let me describe briefly how one can make an antibody fluorescent. Under suitably alkaline conditions (pH 9.0) aromatic isocyanates will react with the free amino groups of protein molecules to form a urea-like linkage, a reaction introduced into immunology by Hopkins and Wormall in 1933 (4) and later used by Creech and Jones (5) to couple carcinogenic hydrocarbons to carrier proteins. After an initial demonstration that a reaction between anthracene isocyanate and rabbit antibody could be carried out without serious damage to the specificity of the antibody, Creech, Jones, Berliner, and I (6) demonstrated that antigen could be visualized in the phagocytic cells of the mouse by means of specific antibody labeled with fluorescein.

The choice of fluorescein has proved a happy one. Fluorescein was originally chosen because of the virtual absence of green fluorescing materials from mammalian tissue, and because of the brilliance of the greenish-yellow light which fluorescein emits. In fact, the quantum efficiency of fluorescein is reported to be about 75 percent (7). Moreover, although we did not think of it at the time, its emission wave length

of 5,200 Å is very close to the maximum of retinal sensitivity (8). Recently, several new compounds have been successfully tried as labeling materials in order to provide more than one color for purposes of identification: rhodamine, orange-red (9) and dimethylaminonaphthyl sulfonic acid, yellow (10, 11). The most recent advance in labeling was the introduction by Riggs and co-workers (12) of the isothiocyanate instead of the isocyanate (13). The isothiocyanates of fluorescein and of rhodamine are stable solids which can be added to buffered dilute antibody solutions and will react without need of organic solvents. They are commercially available and have put the labeling procedure into the hands of everyone.

Such labeled antibody solutions are the simple means of merging immunology and morphology; they bridge the gap between the world of the microscope and the world of immunological specificity. As such they give the specificity of antigen-antibody reactions to the cytologist, and add the microscope to the weapons of the serologist. Under favorable circumstances an enzyme can be precisely localized to a secretion granule (14) and a few bacterial cells identified in a large, mixed flora (15). The immunologist can study some of the reactions of antigen and antibody in vivo, for example, and look to see where injected antigen is concentrated and where the resulting antibody makes its first appearance.

The actual specificity of the reactions depends of course on the quality of the antibody solution. If it contains an unknown mixture of antibodies, the observations made with it will be uncertain. What one sees of such a specific reaction depends on the fact that antibody molecules, once reacted with specific antigen, cannot be dislodged by the saline used to rinse off the excess, unreacted molecules. The reliability of observations depends on the care with which control observations are carried out, and upon the appropriateness of their selection. Although this is not the place to describe or to mourn the technical details involved in the successful use of labeled antibody for tissue localization of a chosen antigen, it would be unfair not to mention that there are difficulties, sometimes almost insurmountable, due to interactions between fluorescent protein molecules in the



Gradual development of influenza A antigens in infected cells. Progression from left to right. Top row, infection with less than one particle per cell. Bottom row, infection with many particles per cell. (From B. K. Watson, unpublished data.)

An extreme example of the condition favoring the production of incomplete or noninfectious virus as described by Von Magnus (29) is that in which 1,000 particles are available per cell. In this situation Watson found that antigen, shown by absorption to be S antigen, was first visible in the nucleus and only subsequently did viral antigens spread to the cytoplasm and to a lesser extent to the cell wall. During the period when most of the cells contained antigen in the cytoplasm, noninfectious hemagglutinin appeared in the amniotic fluid.

These findings are illustrated in the diagram, which shows from left to right in the top row the usual situation when infection is initiated by small doses. The blackened areas represent viral antigen. It might be said parenthetically that only in or near the cell membrane of infected cells can identifiable virus particles be found by electron microscopy. The antigenic material deeper in the interior revealed by fluorescent antibody is evidently too close to the size of other particles normally present in the cell nucleus and the cell cytoplasm to be distinguishable. In the bottom row the reverse situation, representing infection initiated by high multiplicities of virus, is diagramed.

There is unfortunately no time to illustrate the impressive beginnings which have been made by experimental pathologists in the use of fluorescent antibody in the study of serum

disease, or in the analysis of fibrin and globulin deposits in histological lesions. One curious finding has turned up in the investigation of disseminated lupus erythematosus, where the so-called L.E. factor in the serum of sufferers is found to interact with the cell nuclei of cells from many species, including fish (30).

### Antibody Synthesis

Studies of antibody formation (31) have localized the site of synthesis somewhat more precisely than was possible before and have shown that the synthetic machinery is gradually established during the orderly differentiation of a specialized family of cells, plasma cells. The impression is strong that this family of cells is a specialized response to antigenic stimulation. Moreover, the marked difference in the behavior of the lymph node population during a second exposure from its relatively inapparent reaction to a first exposure is indicative of a profound change in the responsiveness of the cell population. In order to determine whether this change was progressive or whether it became stabilized, Dr. Fecsk and I (32) investigated the effect of prolonging the interval between the two antigenic injections on the maximum height of the secondary response in a large series of mice. We found that the responsiveness increased for 3 or 4 weeks and that thereafter it stayed at a high but fixed level for as long as half a year.

isolated earlier from the patient. (For a summary of the diagnostic uses of fluorescent antibody, see Coons, reference 25).

### Virus-Infected Tissue

I come now to another subject because, fascinating though the problems of diagnosis are to the physician, the diagnostic bacteriologist, and the public health official, it would not be right to fill our evening with them when there are other matters of interest and concern. Also, if a speaker is unwise enough to set as his subject a method of procedure, he must be ready to follow more than one trail.

Some years ago, Dr. Barbara Watson and I (26) published an account of the infection of the chick embryo with the PR8 strain of influenza virus. We had examined the tissues of the embryo for viral antigen at various moments during the progression of the infection. At that time it was noticed that the first evidences of viral antigen appeared, under the conditions of the experiments, in the nuclei of the cells lining the amniotic sac into which the viral inoculum had been introduced. Later, antigenic material made its appearance throughout the infected cell. During the next year, my colleague, Dr. Liu (16) was able to show that the antigen demonstrable in the nuclei of epithelial cells in the infected ferret was the so-called soluble or S antigen of Hoyle (27). This material, which can be extracted from virus particles by ether and which contains the ribonucleoprotein of the virus has recently been found to be a rodlike structure of varying length and about 16 m $\mu$  in diameter. Antigenically, this material is known as the S (for "soluble"), or as the complement-fixing, antigen. It was shown by Hoyle to appear in infected cells before other antigenic components were detectable. The antigen is common to all strains of influenza A, which of course differ in other antigenic properties revealed by other methods of testing (hemagglutinin-inhibition). A further fact is that the S antigen of influenza A and the g or "gebundenes" antigen of fowl plague cross react powerfully, but their hemagglutinins, composed of protein and carbohydrate, do not.

Breitenfeld and Schäfer (28) set themselves to study the chain of events leading to the for-

mation of completed virus particles. They employed tissue cultures of chick embryo fibroblasts infected with about 100 particles per cell of fowl plague virus. After various periods of growth, they examined the cells by means of fluorescent antibody and the yield of virus and of various antigenic components by appropriate tests. They found that the g antigen appeared in the cells before any other component was detectable, and that it was first seen 3 hours after the start of the infection. It was visible in the nucleus of the infected cells and later could also be detected in the cytoplasm. Beginning at about the fourth hour, hemagglutinin was detectable both by staining and by assay of the tissue culture cells; it was first seen in a small concentrated area near the cell nucleus, but not in it. Later, the whole cell filled with hemagglutinin, which obscures the g antigen; and filaments could be seen at the cell wall.

Watson has studied the problem of influenzal replication in the infected amniotic membrane of the chick embryo and has kindly consented to let me present a summary of her main findings. These data have not been published. Watson carried out an extensive series of experiments employing doses varying from 1,000 virus particles per cell to 1,000 cells per particle. She found that the dose has a profound effect on the appearance of viral antigens detectable inside the infected cells. When sections of the infected amnion were stained for viral antigens, it was immediately obvious that the infection was not uniformly distributed among the cells. When there was only an occasional virus particle available, antigen in the infected cells was first detectable late in the course of the infection and then usually only in and near that part of the cell membrane which faced the amniotic cavity. Only gradually, if at all, and after the appearance of infectious viral particles in the fluid, was antigenic material found deeper in the cells, and here it was usually limited to the cytoplasm. Hence, if the genetic material of the virus must enter the nucleus, as many believe, in order to initiate virus infection, the quantity is not large enough to be detectable. This condition of only an occasional virus particle per cell is of course the one found by Von Magnus to favor the production of infectious virus.

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## Driver Health and Traffic Mishaps Studied

A pioneer project to explore the relationship between the physical and psychological status of drivers and traffic accidents was launched in May 1960 by the Connecticut Departments of Health and of Motor Vehicles and the Public Health Service. Using a mobile health examination unit, the study is scheduled to screen between 15,000 and 25,000 selected drivers during a period of 18 months to 2 years. These include chronic violators, drivers in personal injury accidents, and some whose licenses have been suspended or revoked. Selected drivers with good records serve as controls.

Examinations are made of vision and hearing, height and weight, hemoglobin, blood pressure, and the heart and chest. Also carried out are tests for anemia, diabetes, and glaucoma.

The Connecticut State Medical Society is actively participating in followup: screening test findings are evaluated by private physicians of the examinees. The findings may also be of help in shaping legislation for physical examinations of drivers.

A great stimulus to investigation of the antibody response has come in the last 2 years from the introduction by Burnet (33), Talmage (34), and Lederberg (35) of the notion that the effect of an antigen injection is not to instruct responsive cells in the elaboration of an antibody specific to the antigen, but rather to select spontaneously appearing cells to multiply and synthesize a specific protein which by chance they are genetically capable of doing. Although some of the pictures my colleagues and I have published look like clones which might have arisen from a single cell, we have seen them spring from areas where there were at least several precursors when antibody became first distinguishable. These precursors were not at that time distributed in a clump. These observations do not rule out the possibility that such clusters are clones, nor is it necessary to postulate that antibody-forming cells spring from a single cell. There could be a number of specific mutants available. However, the appearance of these clusters must not mislead us into supposing that they must be clones.

This lecture has summarized some of the uses to which visible antibody molecules have already been put. As I predicted, the discussion has been somewhat rambling because the element uniting all these diverse findings has been a way of looking at the world rather than a unifying idea. For this reason, too, it has not been feasible to take any one of these subjects all the way to its present frontier. However, I think you will agree that immunology married to morphology has a usefulness in many areas of biology. It only remains to remember that the quality of the observations will depend on the careful analysis of the antibody solution employed as much as on the morphological knowledge which one brings to his microscope.

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*Isolated cases of rabies in dogs, house cats, foxes, raccoons, and skunks were investigated for clues to the existence of an inapparent reservoir of the disease.*

## Sporadic Animal Rabies in Florida

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and ARTHUR L. LEWIS, D.V.M.

**R**ABIES in wildlife and domestic animals has been the subject of intensive study in Florida during the past 5 years. The State board of health laboratories examined 519 rabid animals of various species from 1951 through 1958, an average of 65 heads per year (table 1). In the preceding decade an average of 236 animals a year, mostly dogs, were found to be rabid. Vaccination and local quarantine have been credited with reducing the number of rabid animals encountered and have almost eliminated endemic rabies in dogs. With the gradual reduction of this disease in dogs and the evolution of an increasingly effective animal bite reporting procedure, the sporadic cases in wildlife have now assumed major importance in Florida.

When a careful field investigation revealed that only a single animal was infected, it was considered to be a sporadic case; that is, the rabid animal appeared to be isolated in time and space from all other rabies infections. This classification has been useful in guiding our search for evidence of possible repeated con-

tacts with an inapparent reservoir of rabies in nature.

The quest for such a reservoir was intensified after the infection was found to be widespread in insectivorous bats in Florida (1, 2). Examination of 5,503 bats (3) established the presence of rabies in apparently normal animals in all locations adequately studied in Florida. The evidence suggested that bats could be the inapparent rabies reservoir. Although on three occasions rabid bats were recovered from dogs and house cats which had captured them, there was no evidence that this contact spread the infection. Several attempts to infect mice in the laboratory by inducing presumably rabid bats to bite them were unsuccessful.

We undertook intensive investigations of sporadic cases of rabies to determine whether or not there existed an inapparent reservoir serving as a source for the spread of the infection in Florida.

Three hypotheses were suggested by the evidence at hand. First, there is the possibility that the bat, or some other equally elusive small mammal species, is the primary reservoir and may infect carnivores directly. In this event, the recognized vectors would be infected while capturing the reservoir species or when sniffing moribund animals that attracted their curiosity. The reservoir species would necessarily be unaggressive when rabid so as to explain its non-recognition in the past. This theory may be called the nonaggressive, single-species reservoir.

Second, it is possible that some of our recog-

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## STATEMENT

*By Leroy E. Burney, Surgeon General,  
Public Health Service*

# Influenza Immunization

Two outbreaks of influenza swept the United States in the fall of 1957 and the winter of 1958, resulting in 60,000 more deaths than would be expected under normal conditions. There were, in addition, more than 26,000 excess deaths during the first 3 months of 1960 which also were considered to be the result of influenza.

These departures from the usually predictable norms prompted the Surgeon General's Advisory Committee on Influenza Research to analyze the cause and to seek measures to prevent such an occurrence in the future.

The committee found that a new antigenic variant, the Asian strain, because of its widespread introduction and the general lack of resistance to it, was the direct cause of the excess number of deaths, not only in the total population but most markedly among the chronically ill, the aged, and pregnant women. As a result of these findings, the Public Health Service is urging a continuing program to protect these high-risk groups in order to prevent a recurrence of this excess mortality.

The high-risk groups who contribute most to the excess deaths and who the Public Health Service believes should be routinely immunized each year are:

1. Persons of all ages who suffer from chronic debilitating disease, in particular: (a) rheumatic heart disease, especially mitral stenosis; (b) other cardiovascular diseases, such as arteriosclerotic heart disease or hypertension—especially patients with evidence of frank or incipient insufficiency; (c) chronic bronchopulmonary disease, for example, chronic asthma, chronic bronchitis, bronchiectasis, pulmonary fibrosis, pulmonary emphysema, or pulmonary tuberculosis; (d) diabetes mellitus; (e) Addison's disease.

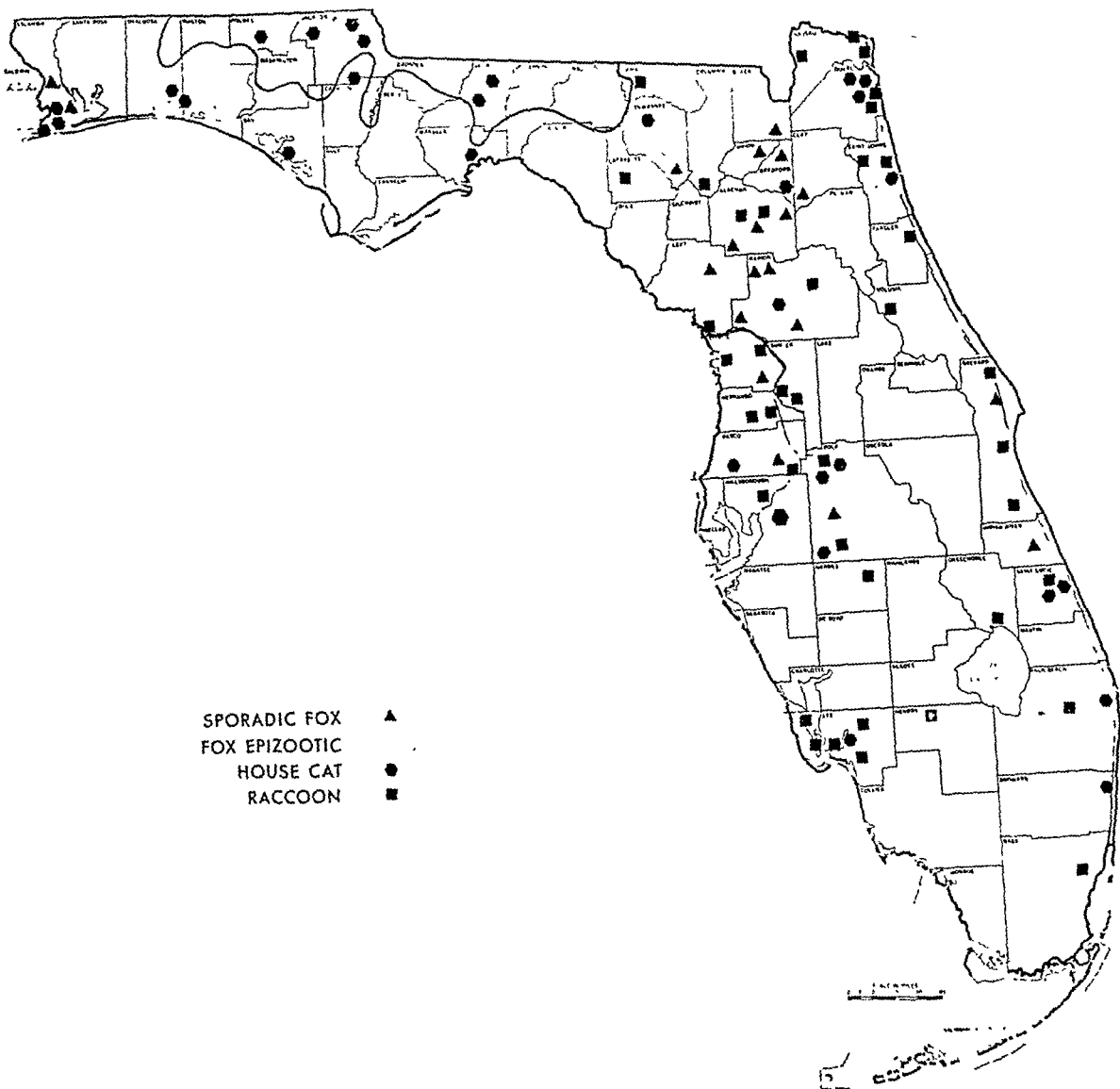
2. Pregnant women.

3. All persons 65 years or older.

The adult dosage recommended by the advisory committee for initial immunization is 1.0 cc. (500 cca units) of polyvalent vaccine, administered subcutaneously on two occasions separated by two or more months. Preferably, the first dose would be given no later than September 1 and the second no later than November 1. Persons previously immunized with polyvalent vaccine should be reinoculated with a single booster dose of 1.0 cc. subcutaneously each fall, prior to November 1. The only contraindication to vaccination would be a history of food allergy to eggs or chicken or a prior history of allergic reaction to an egg-produced vaccine, such as the commercial influenza product.

The time to start such a program is before the onset of the influenza season this fall. In the past, influenza vaccination has been sparse and sporadic, and primarily in response to an epidemic or the threat of an epidemic. The unpredictability of recurrence of influenza and its continued endemic occurrence are well known. Therefore, the Public Health Service strongly recommends that immunization of these high-risk groups be started now and continued annually, regardless of the predicted incidence of influenza for specific years.

The members of the Surgeon General's Advisory Committee on Influenza Research are: Colin M. MacLeod, M.D., chairman, University of Pennsylvania, Fred M. Davenport, M.D., University of Michigan, Morris Schaeffer, M.D., bureau of laboratories of the City of New York Health Department, George Burch, M.D., Tulane University, Dorland J. Davis, M.D., National Institute of Allergy and Infectious Diseases, Public Health Service, Thomas F. Sellers, M.D., Georgia State Department of Health, and Glenn S. Usher, M.D., Communicable Disease Center, Public Health Service.



<sup>1</sup>Symbols indicate the locality. In several sites more than one individual of a species was found to be rabid. Data in some of the older records could not be confirmed and the sites are not indicated.

puppy had been housed in a utility room every night and had never had noticeable wounds. It was seen by a veterinarian several times during this period but was not immunized against rabies. No other animals became rabid during 90 days of quarantine observed by the subdivision.

It seemed unlikely that a rabid dog, skunk, fox, or raccoon could have passed through the subdivision, which was heavily populated with children and unvaccinated dogs, without at-

tracting attention or infecting another animal. Inspection of the utility room indicated that such a vector would have had to contact the puppy outdoors in the daytime. During the previous year three rabid bats had been collected within a mile of this subdivision.

#### House Cats

Forty-four house cats from all parts of the State were recorded as being rabid during the

nized vector species support enzootic rabies which goes undetected because of irregularities in surveillance or because of the usually benign behavior of rabid individuals. Thus, the enzootic condition would be discovered at infrequent intervals, and the new, recognized infections would appear to be sporadic cases. The true nature of the spread would go undetected.

A third possibility is that several different species of wild carnivores together maintain temporary transmission chains for enzootic rabies, but the patterns of transfer within a species or between species are not clear. This may be called the multispecies endemicity hypothesis.

Other explanations, such as the arthropod reservoir and various viral change hypotheses, have been suggested, but data in support of these are not conclusive. Evidence gathered in our studies implies that these two hypotheses are not necessary to account for the behavior and continued existence of rabies infection in Florida.

We undertook intensive investigations of rabies cases which appeared to be sporadic to determine whether or not there existed an inapparent reservoir serving as a source for the spread of infection in Florida. Data in several of the early cases were incomplete or could not be verified. Victims and witnesses could not be located in several instances. We gathered detailed accounts in more than 135 cases; 36 of these were considered to be sporadic.

All rabid animals were diagnosed in the laboratories of the Florida State Board of Health. A positive diagnosis was based on identification of Negri bodies in brain material

prepared with modified Sellers' stain. Animal brains in which Negri bodies were not found upon direct examination were inoculated intracerebrally into five laboratory mice which were observed for 30 days. Mice dying within this period, or those sacrificed at the end of it, were examined microscopically. All animals referred to here as rabid yielded Negri bodies at some stage of this examination.

## Dogs

Sporadic cases of rabies in domestic dogs were investigated whenever possible, but little was learned about contacts with a possible inapparent reservoir. Of the 149 rabid dogs reported since 1951, 34 infections occurred simultaneously with a fox rabies epizootic. Most of the remainder were exposures related to urban epizootics confined to dogs. All sporadic cases, with one exception, involved stray or ownerless dogs. Rarely was the owner of a rabid dog known, and details of its origin and recent history were usually not available. This lack of data made the attempted study of sporadic cases of rabies in dogs unproductive. In the search for rabies cases caused by contact with inapparent reservoirs, little progress can be expected from studies of sporadic infection in dogs.

However, one case had an interesting history. The head of a rabid puppy about 4 months old was submitted to the State laboratory from a subdivision in Gainesville in April 1958. The puppy had been born in a nearby subdivision, and all dogs with which it had had contact, including littermates and the mother, were accounted for. After leaving the litter, the

Table 1. Rabies reported in Florida, 1951-58

Species	1951	1952	1953	1954	1955	1956	1957	1958	Total
Dog.....	8	12	24	23	41	10	17	14	149
Cat.....	0	1	2	11	5	10	9	6	44
Fox.....	1	0	15	19	12	14	73	16	150
Raccoon.....	4	7	10	16	11	13	7	15	83
Skunk.....	0	1	1	2	1	0	2	2	9
Bat.....	0	0	7	1	8	10	7	7	40
Cattle.....	2	0	5	16	3	4	6	2	38
Bobcat.....	0	0	0	0	1	0	0	0	1
Horse.....	1	0	0	1	1	1	1	0	5
Total.....	16	21	64	89	83	62	122	62	519

winter trend in seasonal appearance of infection toward the south.

In two cases the behavior of the vector was indicated because the kittens had been confined in screened dwellings all of their lives. One case occurred in May 1956 in the heart of Lakeland, Polk County, within a section of small, closely spaced houses. Two 6-week-old kittens were being weaned by the healthy mother cat after having lived on a screened porch since birth. The owner was reasonably sure that neither kitten had been off the porch, although a daughter may have carried them out for short periods once or twice. The rabid kitten bit the child and died a few hours later. The owner had been scratched a few days before. Evidence of rabies was found when brain tissue from the kitten was injected intracerebrally into mice and the virus was isolated by standard methods.

The littermate and three adult cats belonging to the same owner were healthy at that time. Wounds had never been observed on either kitten. The littermate died of some disease while in quarantine, but rabies virus could not be isolated from it. No other cases of rabies were reported from this area that year. Two years earlier and less than a half mile away, a rabid 3-week-old kitten, one of a litter of three or four belonging to a stray mother, bit a child. It was known that the mother cat had brought rats and mice to the kittens. Lakeland is noted for the large number of yellow bats (*Dasypterus floridanus*) collected in town (1). This bat has been found to have an infection rate of about 2 percent in nature and is one of the most powerful biters among Florida bats.

A similar case occurred in West Palm Beach during April 1958. Two kittens from a litter of three died of rabies at an age of 6 or 8 weeks. These kittens were born and reared inside a screened house and left it only once, when a visiting child played with them on the lawn one morning for about an hour. The owners were certain that the kittens never left the house at any other time before they were adopted. All three went to separate homes and one developed symptoms of rabies about a week later. The other two kittens were recovered and quarantined, one dying of rabies 17 days after quarantine. The third kitten was killed and examined,

but no evidence of rabies was found. The mother cat was healthy 8 months later and was described as a wonderful hunter. She had often brought in living rats and mice with which the kittens played; however, no bats were observed among the offerings.

Six other cases of rabies in kittens were investigated and found to follow this general pattern. These kittens had all spent more time outdoors, and some had never been in a house. Three of them were less than 6 weeks old. None of these kittens showed any evidence of a bite or wound. The wounds usually observed on victims of dogs, raccoons, and some foxes would kill a kitten of this size outright, and certainly could not be overlooked in the usual attention given to pets.

The data from these interviews suggest some small animal as a reservoir, perhaps one brought to kittens by mother cats and used in hunting practice. A study of the mammals used in this way is indicated. Rabies has not been reliably reported from native rats and mice in Florida, though only a few dozen of these have been examined carefully. We have observed cats use moribund and rabid bats as practice game on several occasions.

#### Foxes

Data on fox rabies in Florida are presented in another paper (4) and are summarized here. The distribution appears in figure 1. There was no clear seasonal trend in the sporadic cases. Sporadic infections were not reported from the epizootic fox rabies areas along the Georgia and Alabama borders, where two known epizootics occurred in adjacent areas of the three States.

In the peninsular counties of Florida, which are distinct from the epizootic area in geography, ecology, and economy, 18 sporadic cases of rabies have occurred in foxes since 1951. Two other rabid foxes, near Pensacola in Escambia County, were not correlated with other rabies cases and appeared to be sporadic. Since rabid foxes are reported frequently during epizootics, it is unlikely that an epizootic in the fox population would be unreported in peninsular counties such as Alachua, Marion, and Polk, where reporting is as effective as in the counties with epizootics. The fox epizootics discussed here










1951-58 period, and persons who had been attacked by 29 of these were interviewed. Fourteen rabid house cats were reported concurrently with several fox rabies epizootics in western Florida, and at least three of these cats had been bitten severely shortly before exhibiting symptoms of rabies. Presumably, fox rabies spilled over into the house cat, since no rabid cats were observed in the years before or after fox rabies swept through these counties. All of them bit or attacked human beings, but no other cats or domestic animals. This behavior, as reported by the victims, indicated that house cats do not transmit rabies virus freely among themselves.

Twenty-one cats became rabid in peninsular Florida, where epizootic rabies has apparently been limited to infection in raccoons, which

probably attack house cats. However, most of these counties have recorded sporadic rabies in other carnivores. Epidemiological investigations of rabies in house cats failed to reveal evidence of the disease in any other animal. Every rabid house cat in the peninsular counties investigated appeared to have acquired a truly sporadic infection (fig. 1).

Some of these cases may have resulted from contact with a hidden rabies reservoir. Data on rabid kittens obtained in interviews with owners were especially enlightening. Nine cases of rabies occurred in kittens less than 7 months of age. None of the mother cats or other neighborhood pets became rabid or had disappeared. Figure 2 shows the lifespans and dates of death of the kittens, arranged by counties in north-to-south order. There is some indication of a

Figure 2. Seasonal appearance of rabies during the lifespan<sup>1</sup> of nine kittens in Florida, 1954-58

Year	County		Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.
1957	ESCAMBIA													
1956	SUWANNEE													
1957	BRADFORD													
1956	ST JOHNS													
1956	MARION													
1954	POLK													
1956	POLK													
1956	HILLSBOROUGH													
1958	PALM BEACH													

<sup>1</sup> Birthdates were calculated from the best estimate of age at death, often based on the owner's memory or on size alone.

rabid. Despite this evidence of a severe localized epizootic, no attacks were reported from the area, although large numbers of people fished and picnicked along the highways and canals in this part of the Everglades. Reports of cattle and other livestock dying of rabies were rare in the raccoon rabies area, in marked contrast to the situation in parts of the State where dog or fox epizootics occurred. If raccoons are no more aggressive toward each other than they were toward the victims interviewed in this study, it is difficult to understand how the infection can be maintained in the raccoon population. Our observations on prevalence and geographic movement suggest that enzootic spread of rabies does occur in raccoons.

Unaggressive behavior did not mean that raccoons were not a serious rabies problem. On the contrary, an average of nine persons per year were bitten in Florida. Often such persons were so severely and painfully bitten they needed help to escape from the animals. Further, rabid raccoons were even more important as a vector for introducing rabies into dog populations. Dogs were especially likely to be bitten when they harassed sick raccoons that wandered into communities or towns. The dog rabies epizootic of 1955 in Tampa, Hillsborough County, probably started with a hound that had caught an infected raccoon. Nearby Pasco County had a number of rabid dogs during the same year, the disease probably spreading up the Hillsboro River through infected raccoons.

Most of the danger from the raccoon stems from the inapparent nature of rabies in these animals. This characteristic permitted the infection to move considerable distances without attracting attention. When a rabid raccoon was reported from Inverness, Citrus County, on the Withlacoochee River and its lakes, a trapping program was initiated to investigate the animal population. Of 24 raccoons captured along the river, 1 was rabid. This animal was taken about 35 miles downriver from Inverness, but the two intervening waterfront towns of Dunnellon and Yankeetown did not report any rabid animals or unusual raccoon behavior. Rabid raccoons were discovered almost simultaneously on either side of eight other river or waterfront towns, but none of the towns

reported any rabid animals, although infected raccoons presumably passed through the communities.

Our data indicate that rabies was common in the raccoon population of peninsular Florida. The unaggressive nature of rabid raccoons and, consequently, the low reporting rate merit further study. Our data fail to show that raccoons have had any contact with an inapparent rabies reservoir in other species. The wide distribution but sporadic reporting of rabies in raccoons made it virtually impossible to recognize such contacts.

### Skunks

Data on rabid skunks are meager in Florida. Nine cases were recorded, but there were no data on animal populations where six of these occurred. In two cases trapping yielded 30 skunks, but none of these was rabid. No rabid skunks were submitted to the State laboratories from the fox rabies epizootic area, although striped skunks, *Mephitis mephitis*, were abundant in some places. This animal inhabits all mainland Florida. The spotted skunks, *Spilogale ambarvalis* and *Spilogale putorius*, are reported only from the lower peninsula and from extreme western Florida, respectively. It is not known which species made the attacks.

Heads of two rabid animals, one fox and one raccoon, smelled so strongly of skunk scent when received in the laboratory that there was little doubt they had contacted a skunk shortly before they were killed. Obviously, rabid skunks might infect other carnivores that attack them. The infrequency of attacks by rabid skunks, the aggressive nature of one of the two rabid skunks observed, and the attention they get when active in the daytime seem to exclude the striped skunk, at least, from consideration as the effective but inapparent rabies reservoir we seek. The behavior of both genera of skunks, when rabid, should be studied under experimental conditions.

### County Observations

The nature of sporadic rabies can be better understood when the cases recorded in a single county are examined. Polk County is typical

swept through 13 or 14 counties in one movement, requiring more than 5 years to subside. In areas with sporadic fox rabies, cases of rabies in cattle are unknown, but they are common where rabid foxes occur in numbers. Our data indicate that rabies is easily recognized when it exists in epizootic form in gray foxes. The preponderance of evidence suggests that sporadic cases are caused by an effective contact with an inapparent reservoir. However, additional data are needed on the proportion of rabid foxes which attack people as compared with those which do not.

## Raccoons

Rabies was first recorded in Florida raccoons about 1947 when it appeared in Brevard County and spread north and south along the Intra-coastal Waterway. By 1958, a total of 31 counties had reported rabid raccoons, most of them occurring as a sporadic case. The 83 recorded since 1951 were investigated whenever victims and witnesses could be located. Figure 1 shows the localities from which rabid raccoons were submitted to the State laboratories. The disease in raccoons is restricted to the peninsular part of the State. Even during fox epizootics, rabid raccoons were never reported from western Florida. There was no seasonal trend in the occurrence of the 47 cases on which data were available.

Estimates of the raccoon population in 11 sites where rabid raccoons had most recently been reported revealed no clear correlation between the appearance of the infection and density of the raccoon population. In five sites the local populations appeared to be at cyclic lows; in three, at nearly maximal density; and in the remaining three, the density was intermediate. These investigations revealed the short duration of extremes of abundance in raccoon populations, as evidenced by trapping success, tracks, and other signs. Movements and seasonal shifts in response to changes in water levels and seasonal food supplies influenced simple abundance estimates even more than the absolute number of animals in a unit area. It proved almost impossible to trap out a raccoon population, even when intensive efforts were made for more than a month. This is in strong contrast to fox pop-

ulations, in which a reduction in tracks and in trap success is apparent after a few days of trapping (5).

A time and space relationship was found between rabid raccoons reported from the counties along the Withlacoochee-Hillsboro River system (midwest coastal area) and along the Intra-coastal Waterway from Miami to Jacksonville. These movements showed a strong correlation between raccoon rabies and the water; 40 of the 43 animals investigated were first observed within 3 miles of a major stream or waterway. Most of them were taken along the waterways. The data indicate that spread of rabies through raccoon populations follows major waterways. The slow rate of movement and the inapparent nature of the infection make us reluctant to term this an epizootic spread, however.

The apparent sporadicity of reports seems to be caused by the unaggressive nature of rabid raccoons, according to witnesses and victims. In 38 incidents, not one person indicated that the raccoon had attacked persons or dogs unless a close approach was followed by an overt act by the victim. People were usually bitten when they or their dogs tried to kill or capture raccoons that wandered, often obviously sick and in daylight, into doorways or along streams and highways. Victims "knew" something was wrong in some cases but were vague as to how they "knew." At least five of these animals were thought to be escaped pets, and three of them were put in cages because of their gentle behavior. Two were kept as pets for several days, and their captors suspected rabies only after the animals were found dead.

Two fishermen allowed a fearless and obviously distressed raccoon to pass between them and the river in which they were fishing without being attacked. When the animal passed a second time under their cane poles, they decided to capture and submit it for laboratory examination. This uniformly benign behavior is startling when first observed by anyone familiar with the viciousness of a significant portion of rabid dogs and foxes, which attack from considerable distances.

Six of the twenty-eight raccoons taken in traps or found dead on highways in Palm Beach County by J. E. Held, D.V.M., in 1956, were

Table 3. Species exposed by rabid animals in 197 case histories

Victim	Vector					
	Dog	Cat	Fox	Raccoon	Skunk	Bat
Dog.....	Yes.....	No.....	Yes.....	Yes.....	?.....	Yes.
Cat.....	Yes.....	No.....	Yes.....	No.....	No.....	Yes.
Fox.....	No.....	No.....	?.....	No.....	No.....	No.
Raccoon.....	No.....	No.....	?.....	?.....	No.....	No.
Skunk.....	No.....	No.....	?.....	?.....	No.....	No.
Bat.....	No.....	No.....	No.....	No.....	No.....	?
Humans.....	Yes.....	Yes.....	Yes.....	Yes.....	Yes.....	Yes.
Livestock.....	Yes.....	No.....	Yes.....	No.....	?.....	No.

Yes=Observed contact.

No=No observed contact.

?=No observed contact but with attack indicated by epidemiological evidence.

that dogs, foxes, and possibly raccoons support epizootic rabies when suitable populations exist. Bats of various species may support epizootic rabies also, although the methods of transmission between bats, even between individuals of one species, have not been established in Florida. House cats and skunks apparently do not support epizootics, and seemingly do not infect others of their species, although skunk epizootics are reported from other States.

Dogs, when rabid, infected other dogs, house cats, and livestock, but apparently did not infect wildlife. In contrast, rabid house cats attacked only persons, and cats in contact with them did not become rabid. Foxes attacked other carnivore species, livestock, and humans. Observations indicated that some rabid foxes will attack anything moving, including inanimate objects. In contrast, rabid raccoons attacked nothing that did not first attack or threaten them.

Bats have exposed persons, dogs, cats, and presumably wildlife species also. There is now evidence that rabid bats are infective (6). Any reservoir likely to infect cats, kittens, or puppies may be considered equally likely to function for skunks, foxes, and even raccoons.

If these data adequately depict the status of rabies in Florida, some general impressions can be expressed concerning the existence of an inapparent reservoir. The epizootics observed in foxes and the endemism seen in raccoons may

explain all of the rabies cases recorded from western Florida and some of the sporadic cases in the peninsula. Since some of the sporadic cases, especially in kittens, could not possibly be traced to a bite by a raccoon, fox, or dog, it is logical to assume that some other vector is responsible, at least for some of these cases. It may be that this vector, which functions for kittens, and presumably for cats, infects other species also. Whether rabid insectivorous bats are capable of this, we do not know, though our data seems to exclude the carnivores. There is little room for doubt that some wildlife reservoir for rabies exists in Florida. Its identity and the means of the spread of infection need to be determined by further study.

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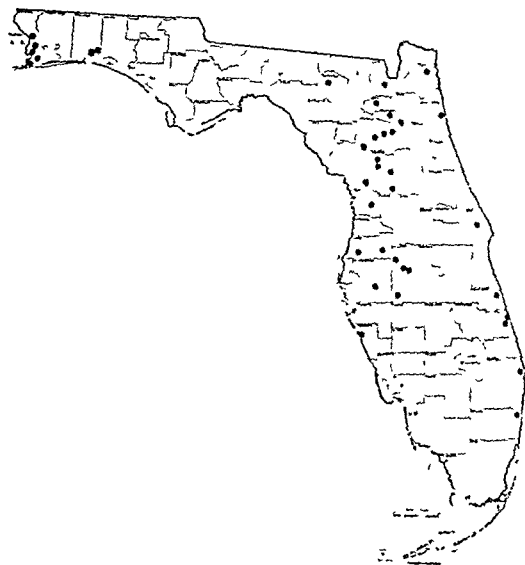


of the area where sporadic cases occurred most frequently. Twelve rabid animals were reported between 1951 and 1958, and these were distributed among six species. Careful case history studies established that no two animals of a single species were ever in contact with each other. Five animals, one bat, two kittens, one puppy, and one fox, were reported within the city limits of Lakeland, but there is reason to doubt that contact existed between any two of them. The lifespan of the kittens and the puppy did not overlap. The remaining seven rabid animals were widely separated in time and space, covering an area of more than 700 square miles and a period of 5 years. Similar situations were observed in at least 10 other counties. These 11 counties had a total of 84 sporadic cases, excluding the cases in raccoons and those related to dog rabies epizootics in two counties, or an average of almost 8 cases per county. Some cases involved bats or livestock, but an average of almost two cases per year was maintained in carnivores in each county for the years in which rabies was reported. There seemed to be a slow but steady rate of infection among the susceptible carnivores. The surveillance and animal bite reporting in these counties was probably as good as that attained anywhere.

### Comment and Conclusion

From locations of sporadic cases of rabies, excluding dogs and raccoons (fig. 3), and their seasonal incidence (table 2), it must be inferred that, if a single reservoir was responsible, it functioned constantly over a large area, but rather infrequently at any given place. There was no evidence of a slack season or of periods of increased activity in one circumscribed area.

Figure 3. Sites of sporadic rabies cases in Florida in carnivore species,<sup>1</sup> 1951-58



<sup>1</sup> Dogs and raccoons excluded. Each case for which a site is given was found to be isolated in time and geography from other known rabies cases. Sites for a few early cases could not be determined.

The possibility that a multispecies enzootic exists, with infection between different species being more frequent than within any one species, has been mentioned. From data given in 197 case histories, the relationships of species of rabid animals to their victims, including persons, has been charted (table 3). A need for further study of the behavior of rabid animals of all species under experimental conditions is indicated. Some knowledge of the usual relationship between foxes and skunks, foxes and house cats, and skunks and house cats would be enlightening. The behavior of animals of all species toward rabid raccoons and bats should be investigated.

We can see from our present data, however,

Table 2. Seasonal incidence of sporadic rabies in Florida, 1951-58

Species	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Total
Fox.....	3	3	0	1	1	0	2	1	0	2	1	2	16
House cat.....	2	0	0	2	1	0	2	3	1	2	1	0	14
Other <sup>1</sup> .....	0	1	1	1	0	0	1	0	0	0	1	1	6
Total.....	5	4	1	4	2	0	5	4	1	4	3	3	36

<sup>1</sup> Skunk, cattle, dog.

*Coccidioidin testing of home-raised cattle in Arizona defined geographic boundaries and indicated the relative infectivity of various parts of the endemic area of the State more specifically than skin tests of human beings. The endemic area was found to be practically co-terminous with the Lower Sonoran Life Zone.*

## Distribution of *Coccidioides immitis* Determined by Testing Cattle

KEITH T. MADDY, D.V.M., M.P.H., H. GILBERT CRECELIUS, Ph.D., and RICHARD G. CORNELL, Ph.D.

GEOGRAPHIC distribution of *Coccidioides immitis* in Arizona has been estimated previously by noting the areas of the State in which cases of coccidioidomycosis in human beings are reported (1-10), by several skin test surveys (fig. 1) conducted on various population groups (10-17), and by trapping rodents in specific geographic areas and examining them for the presence of *C. immitis* (18).

Skin test studies on man, however, have all had shortcomings which make pinpointing the infectivity of a small area difficult. In some instances large areas with little population were not surveyed. Many persons who migrate to Arizona from the midwest have been previously infected with *Histoplasma capsulatum*, a potential cause of a cross reaction to the coc-

cidioidin skin test. Also, persons living in the State travel about a great deal both inside and outside Arizona.

Although only a few studies of coccidioidin skin tests in animals have been reported (19, 20), it has been shown that cattle within the more obviously endemic areas become infected and react to skin tests. This study was undertaken to determine more definitely the extent of the endemic areas and to map the relative infectivity in various parts of Arizona.

### Materials and Methods

Between 1954 and 1959, 11,643 cattle were coccidioidin skin tested in the 14 counties of Arizona. The cattle were selected at random in various parts of each county. Few of these animals had been more than several thousand feet from where they were born. Their ages to the nearest year ranged from 1 through 6.

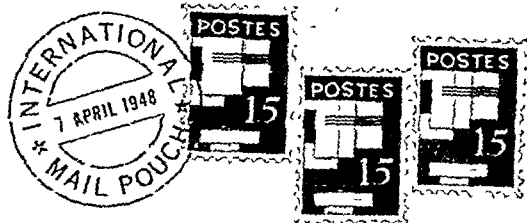
Lot 15087 of coccidioidin was used early in the survey and later lot 59-62 was used. It was standardized to the same sensitivity as lot 15087 by simultaneously testing cattle with both skin test agents and then concentrating the 59-62 behind a collodion filter until the skin test agents gave identical results. Both lots were furnished by Dr. C. E. Smith of the University of California at Berkeley.

The specificity of undiluted lot 59-62 in de-

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*Dr. Maddy, a veterinarian with the Communicable Disease Center, Public Health Service, is stationed at the University of California School of Public Health, Berkeley. Dr. Crecelius is director of the division of laboratories, Arizona State Department of Health. Dr. Cornell is chief of the Laboratory and Field Station Statistics Unit, CDC, in Atlanta, Ga.*

*The article is based on a paper given at a conference of the Epidemic Intelligence Service, CDC, in Atlanta, Ga., on April 16, 1959. The investigation was supported in part by a grant from the National Institutes of Health, Public Health Service.*



## *Wells for Siem Reap*

After 8 wells were drilled in a demonstration, the residents of Siem Reap, a town of 10,000 population, drilled an estimated 300 additional wells themselves. Cambodia's Ministry of Public Health and the U.S. Operations Mission supplied pumps, casing, and drilling equipment.

—ANTHONY J. KRANASKAS, *acting chief, Public Health Division, U.S. Operations Mission, Cambodia.*

## *Quackery in the U.S.S.R.*

For publishing and promoting quack cures for cancer and other diseases, the Soviet press was assailed by a panel of 16 prominent Soviet physicians, headed by Prof. Nikolai N. Blokhin, president of the Academy of Medical Sciences, it was reported by the *New York Herald Tribune*, April 22, 1960. The physicians charged that the press was confusing the public and discrediting Soviet medicine in publishing reports of "cures" which had been proved to be spurious and dangerous.

The articles the physicians cited described a professor's claim that cancer was caused by round worms, a "cured" case of stomach cancer in a patient who later had to have his stomach removed because of the malignancy, a remedy of boiled vodka and nonrefined resin for tuberculosis, and a special machine that "cured" a ballet dancer's rheumatic affliction.

## *Self-Help in Thailand*

In the Korat Province of Thailand, village health committees are sponsoring the development of health services in 20 village areas, each comprising one or more villages. A total of 14 wells have been installed, protected, equipped with pumps, and 1,344 sanitary privies completed.

For example, in Nativong an eight-member health committee has been functioning energetically for 5

months. The headman donated, for the use of the health worker, a demonstration house which was quickly improved and became a model for the 74 families of the village. Under the committee's leadership, the villagers dug, cased, and covered one well, dug a second, and are planning two more. All but 16 families have privies and many of the men constructed their own privy slabs at the demonstration house. The village is clean and road work is under way. A midwife has established herself and is working effectively. The people of neighboring villages, interested in the achievements in Nativong, asked for a meeting, and a single health committee to serve a nine-village area is planned.

The villagers of Talang in the island Province of Bhuket wanted a clean marketplace and safe water. Although they numbered fewer than 1,000, they organized, and in a few weeks planned and built a market with concrete stalls and good drainage and developed a safe deep well with sufficient flow of water to clean the market daily and serve two schools and public outlets on the main street. Funds, raised locally, paid for a pump, a 4,000-liter elevated storage tank, and the construction of the market.

—ANDREW P. HAYNAL, M.D., *chief, public health division, U.S. Operations Mission, Thailand.*

## *The Korat Pump*

Thai and United States members of the village health and sanitation project have devised a low-cost hand pump to meet special needs in supplying water to the villages.

Required was a pump that could be manufactured of materials locally available throughout the country, and capable of being maintained without removing the pipe from the well, so that block, tackle, and tripod would not be needed.

The Korat pump consists almost entirely of ordinary 2-inch water pipe, including the cylinder. A machine shop can produce it at a total cost equivalent to \$20. Thirty of the Korat pumps were built and installed in various areas and are being evaluated under varying conditions. A form was developed to record data on operations. If the findings are favorable, large-scale production of the pumps will be started to supply an increasing demand in the villages.

—ANDREW P. HAYNAL, M.D., *chief, public health division, U.S. Operations Mission, Thailand.*

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Skin test studies on man, however, have all had shortcomings which make pinpointing the infectivity of a small area difficult. In some instances large areas with little population were not surveyed. Many persons who migrate to Arizona from the midwest have been previously infected with *Histoplasma capsulatum*, a potential cause of a cross reaction to the coc-

cidoidin skin test. Also, persons living in the State travel about a great deal both inside and outside Arizona.

Although only a few studies of coccidioidin skin tests in animals have been reported (19, 20), it has been shown that cattle within the more obviously endemic areas become infected and react to skin tests. This study was undertaken to determine more definitely the extent of the endemic areas and to map the relative infectivity in various parts of Arizona.

### Materials and Methods

Between 1954 and 1959, 11,613 cattle were coccidioidin skin tested in the 14 counties of Arizona. The cattle were selected at random in various parts of each county. Few of these animals had been more than several thousand feet from where they were born. Their ages to the nearest year ranged from 1 through 6.

Lot 15087 of coccidioidin was used early in the survey and later lot 59-62 was used. It was standardized to the same sensitivity as lot 15087 by simultaneously testing cattle with both skin test agents and then concentrating the 59-62 behind a collodion filter until the skin test agents gave identical results. Both lots were furnished by Dr. C. E. Smith of the University of California at Berkeley.

The specificity of undiluted lot 59-62 in de-

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*Dr. Maddy, a veterinarian with the Communicable Disease Center, Public Health Service, is stationed at the University of California School of Public Health, Berkeley. Dr. Crecelius is director of the division of laboratories, Arizona State Department of Health. Dr. Cornell is chief of the Laboratory and Field Station Statistics Unit, CDC, in Atlanta, Ga.*

*The article is based on a paper given at a conference of the Epidemic Intelligence Service, CDC, in Atlanta, Ga., on April 16, 1959. The investigation was supported in part by a grant from the National Institutes of Health, Public Health Service.*

testing cattle experimentally infected with *C. immitis* has been reported (21). Several other preliminary experiments were carried out on naturally infected cattle in the endemic area to arrive at a standard testing procedure. They are summarized briefly here.

Each of 181 cattle was injected intradermally with undiluted and with 1:2, 1:5, 1:10, and 1:100 dilutions of coccidioidin. All animals that reacted positively (indurations of more than 5 mm.) to diluted skin test agents also reacted to the same agent when it was used in a more concentrated form. The reverse was often not the case; that is, an animal might react to a concentrated agent but fail to react to a more dilute solution of it. To the undiluted, 135 reacted, 121 reacted to the 1:2, 94 to the 1:5, 78 to the 1:10, and 37 to the 1:100.

Undiluted coccidioidin was injected in the cervical area of 861 cattle. These skin tests were checked at the following intervals with the following numbers of positive reactions:

24 hours, 310; 48 hours, 380; 72 hours, 455; 96 hours, 505; 120 hours, 435; and 144 hours, 263. Of these cattle, 243 were injected simultaneously in the caudal fold area. The cervical area test resulted in 146 positive at 96 hours, and 87 of these same animals had reactions in the caudal fold area. None of the 59 cervical area-negative cattle gave independently positive reactions in the caudal fold area. There were fewer positives both before and after the 96-hour reading.

Simultaneously, 264 cattle were injected intradermally in the cervical area with 0.1 ml. doses of undiluted coccidioidin and a control broth handled the same way coccidioidin is in its preparation. The control broth gave negative results in all animals, and the coccidioidin gave indurations of more than 5 mm. in 131 animals at 96 hours.

From these preliminary studies it was decided that the coccidioidin would be injected undiluted intradermally in the cervical area

Table 1. Results of coccidioidin tests of home-raised Arizona cattle, by counties

County	Total		Age to nearest year												IAC rates <sup>1</sup>	AC rates <sup>1</sup>	
			1		2		3		4		5		6				
	T	P	T	P	T	P	T	P	T	P	T	P	T	P			
Apache.....	702	0	78	0	320	0	146	0	40	0	68	0	50	0	0	0	0
Cochise.....	636	121	15	1	80	16	235	41	115	17	108	25	83	21	.05	.05	
Coconino.....	516	0	68	0	390	0	21	0	16	0	14	0	7	0	0	0	
Gila:																	
Low altitude....	593	377	291	127	238	209	27	14	16	12	13	10	8	5	.28	.25	
High altitude....	706	1	131	0	374	1	93	0	61	0	32	0	15	0	0	0	
Graham.....	712	260	106	11	159	34	91	28	146	65	118	54	92	68	.17	.15	
Greenlee.....	544	129	107	14	217	51	112	21	45	18	43	11	20	14	.13	.13	
Maricopa.....	1,446	761	367	89	389	179	197	137	213	134	151	113	129	109	.30	.26	
Mohave:																	
Low altitude....	908	120	209	10	354	32	209	36	51	8	53	11	32	23	.11	.11	
High altitude....	530	7	53	0	142	1	71	2	25	0	78	1	161	3	.003	.01	
Navajo.....	722	10	304	2	203	5	61	1	52	1	61	0	41	1	.003	.01	
Pima.....	623	351	243	71	97	69	87	70	91	64	89	68	16	9	.27	.21	
Pinal.....	579	438	182	97	147	130	106	91	53	44	48	41	43	35	.41	.31	
Santa Cruz.....	629	117	211	24	231	42	123	27	46	15	7	4	11	5	.12	.11	
Yavapai:																	
Low altitude....	585	76	251	18	110	13	139	16	30	4	23	6	32	19	.09	.09	
High altitude....	635	5	253	1	186	2	131	1	12	0	18	0	35	1	.063	.01	
Yuma.....	577	86	163	11	149	21	192	31	36	9	30	12	7	2	.07	.07	
Total.....	11,643	2,859	3,032	476	3,786	805	2,041	516	1,048	391	954	356	782	315	0.10	0.09	

T=Number tested. P=Number positive.

<sup>1</sup> Instantaneous annual conversion rates.      \* Annual conversion rates.

NOTE: See technical note p. 961 for method of calculating annual conversion rates.

# Human Coccidioidin Sensitivity in Arizona

Figure 1. Percent of sensitivity of white persons 17-21 years of age who were lifetime one-county residents (left); percent of sensitivity of 955 students 13-24 years of age who had spent 80 percent of their lives in the State (right).

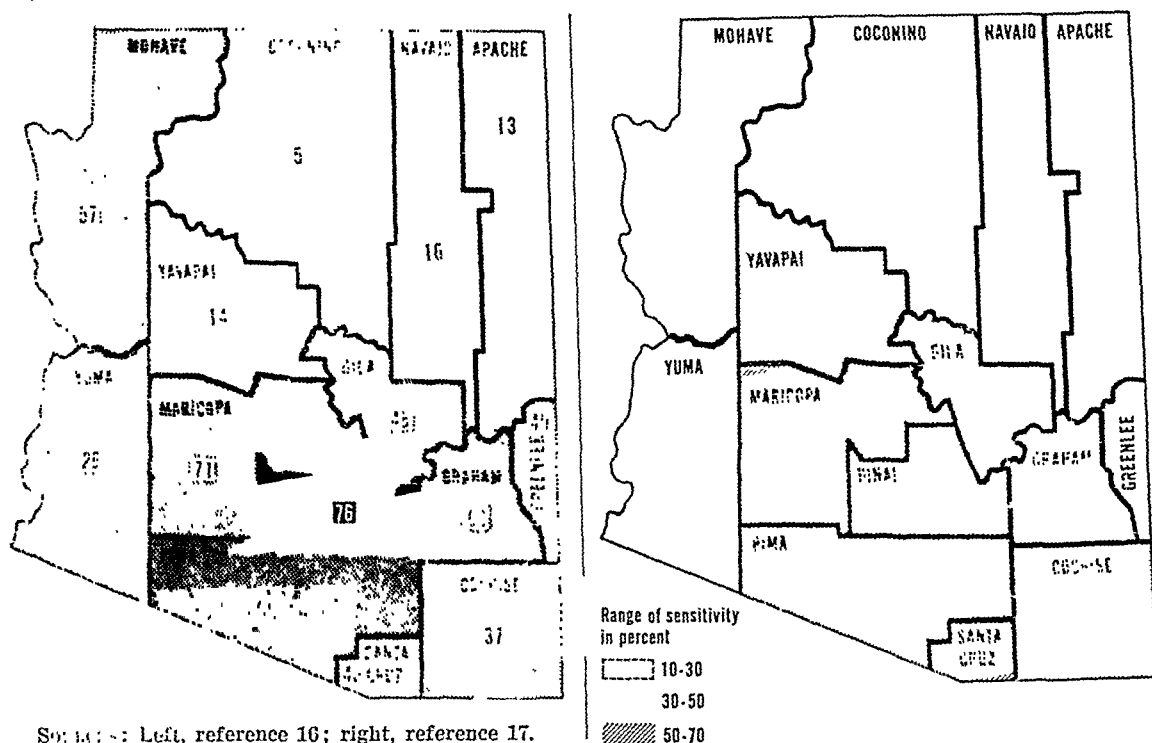


Table 2. Results of coccidioidin tests of home-raised Arizona cattle, by home altitudes

Altitude (feet)	Total		Age to nearest year												IAC rates <sup>1</sup>	AC rates <sup>2</sup>
			1		2		3		4		5		6			
	T	P	T	P	T	P	T	P	T	P	T	P	T	P		
0-500	577	86	163	11	149	21	192	31	36	9	30	12	7	2	0.07	0.07
500-1,000	770	147	79	0	321	35	177	38	83	20	72	30	38	24	.12	.11
1,000-1,500	1,447	851	420	126	389	211	202	161	191	138	135	110	110	105	.29	.25
1,500-2,000	414	271	129	60	119	87	70	56	30	24	31	22	35	22	.42	.34
2,000-2,500	1,216	728	534	198	335	278	114	84	107	76	102	78	24	14	.28	.24
2,500-3,000	668	246	104	9	142	33	88	28	133	59	114	52	87	65	.17	.15
3,000-3,500	887	126	381	28	171	21	202	25	43	8	37	9	53	35	.10	.10
3,500-4,000	1,173	246	318	38	448	93	235	48	91	33	50	15	31	19	.12	.11
4,000-4,500	746	136	55	3	125	18	238	41	128	23	112	27	88	24	.06	.05
4,500-5,000	1,099	11	268	1	300	2	202	3	37	0	96	1	196	4	.003	.01
5,000-5,500	337	10	142	2	99	5	29	1	21	1	19	0	27	1	.01	.01
5,500-6,000	373	0	162	0	103	0	31	0	28	0	37	0	12	0	0	0
Above 6,000	1,936	1	277	0	1,085	1	261	0	120	0	119	0	74	0	0	0
Total	11,643	2,859	3,032	476	3,786	805	2,041	516	1,048	391	954	356	782	315	0.10	0.09

T=Number tested. P=Number positive.

<sup>1</sup> Instantaneous annual conversion rates. <sup>2</sup> Annual conversion rates.

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above) were found in cattle in the three counties (Pinal, Maricopa, Pima) known to have high human conversion rates. The cattle in the low altitude areas of Gila County were also found to have high annual conversion rates, particularly the areas around the artificial lakes on the Salt River.

Medium annual conversion rates (0.11–0.15) were found in cattle in the low altitude areas of Mohave County as well as in Graham, Greenlee, and Santa Cruz Counties.

Low annual conversion rates (0.05–0.09) were found in cattle in Cochise and Yuma Counties, and the low altitude areas of Yavapai County.

Navajo County and high altitude areas of Yavapai and Mohave Counties had a few coccidioidin reactors, resulting in an annual conversion rate of 0.01 for each of the three counties.

No coccidioidin-positive cattle were found in the high altitude areas of Gila County or in Coconino or Apache Counties.

The areas of the State in the altitude range of 1,000 to 2,500 feet had high annual conversion rates (0.24 and above). The rates were lower at less than 1,000 feet altitude and became progressively lower with increases in altitudes above 2,500 feet, so that at 4,500 feet the rate became negligible (0.01), and at 5,500 feet and above it was 0.00.

Although several herds of cattle at altitudes above 4,500 feet had been fed sizable quantities of feed raised in the parts of the State where cattle had high annual conversion rates, only a few animals in these herds were coccidioidin positive.

Of the 841 cattle tested with histoplasmin, 11 gave positive reactions, but all were also coccidioidin positive. There were 18 cattle positive to haplomycin of 763 tested; these same 18 were also coccidioidin positive. The histoplasmin- and haplomycin-positive reactions were found in cattle in areas of high endemicity for coccidioidomycosis.

## Discussion

The skin test surveys on humans in Arizona that are summarized in figure 1 indicate that the number of infections is greater in south

Figure 4. The Lower Sonoran Life Zone of the United States. The endemic area of coccidioidomycosis is almost identical to the zone.



central Arizona than in the northeast part of the State. Figures 2 and 3 showing the cattle test data indicate much sharper differences of infectivity of the various areas of the State. The similarity of the endemic area for coccidioidomycosis with the Lower Sonoran Life Zone, a climate zone (fig. 4), has already been discussed (23, 24).

The Lower Sonoran Life Zone of the Northern Hemisphere has high January and July temperatures and rainfall ranging up to 20 inches per year. The evaluation of three items of climate in combination, the average January temperature, the average July temperature, and the average annual rainfall, yields a good basis for estimating the prevalence of coccidioidomycosis. The July mean temperature of areas of high infectivity is above 80° F. Some infection occurs in areas with July mean temperatures as low as 77° F., but not often below this. The January mean temperature is above 45° F. in areas of high infectivity. Some infections occur where the January mean temperature is as low as 35° F., but not often below this. The annual rainfall is about 5 to 20 inches in the more obviously endemic areas. As rainfall gets progressively less than 5 inches, infectivity of the area drops. Infections do not occur in areas with more than 20 inches unless there are particularly high temperatures to reduce precipitation effectiveness.

The Lower Sonoran Life Zone in Arizona



and that indurations of more than 5 mm. in diameter at 96 hours would be considered positive.

The skin test agents were injected in many cattle at the same time that their blood was being collected for brucellosis serology. In each county some of the same cattle were also tested with other skin test agents, 841 with histoplasmin and 763 with haplomycin.

Histoplasmin lot D-2770 was also used in testing 841 of the coccidioidin-tested animals. Haplomycin lot "Phillips 4, antigen 16" was used in testing 763 of them. These two skin test agents, supplied by Dr. M. L. Furcolow and Dr. R. W. Menges of the Communicable Dis-

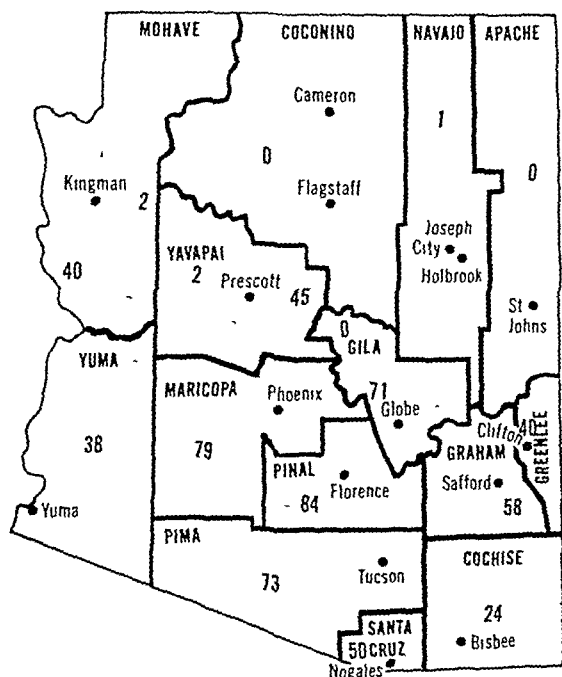
ease Center, Public Health Service, were injected and read by the same method used for coccidioidin.

## Results

The results of the coccidioidin tests are summarized in tables 1 and 2 and figures 2 and 3. The conversion rates to a positive reaction for each geographic area were computed by a method outlined by Manos (22). From various areas of each county of Arizona 11,643 home-raised cattle 1-6 years of age were coccidioidin tested and 2,859, or 24.6 percent, were found to be positive.

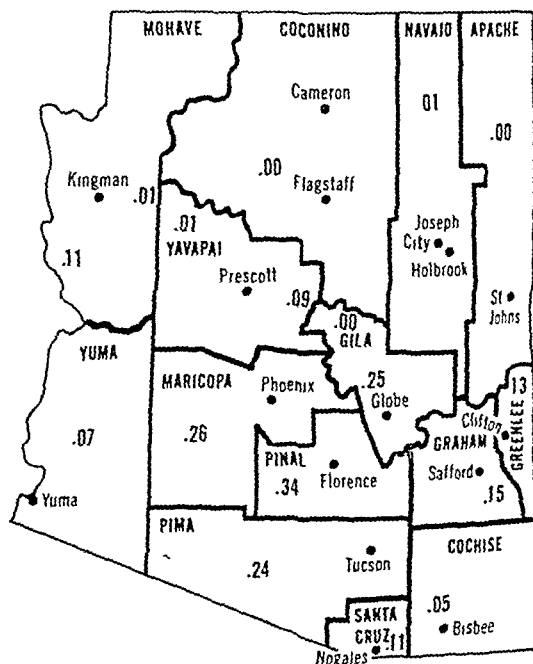
High annual conversion rates (0.24 and

**Figure 2. Percent of coccidioidin sensitivity by counties in tests of 1,736 cattle 5 and 6 years of age<sup>1</sup> in Arizona**



<sup>1</sup>The prevalence of coccidioidin sensitivity in persons who do not move about a great deal is comparable to the prevalence of coccidioidin sensitivity in cattle in the same area. Persons who have lived in an area for 12 years or more have about the same rates as 5- and 6-year-old cattle.

**Figure 3. Annual conversion rates<sup>1</sup> to a positive coccidioidin test among 11,643 cattle in Arizona**



<sup>1</sup>The annual conversion rates, calculated by the Manos method, are almost the same as the actual human infection rates.

NOTE: Only cattle that spent their entire lives on the ranch where they were born were tested. Two percentages are given for Mohave, Yavapai, and Gila Counties; one for tests within the Lower Sonoran Life Zone, the other for tests above the zone. All tests in Greenlee County were within the zone; all tests in Coconino County were above the zone.

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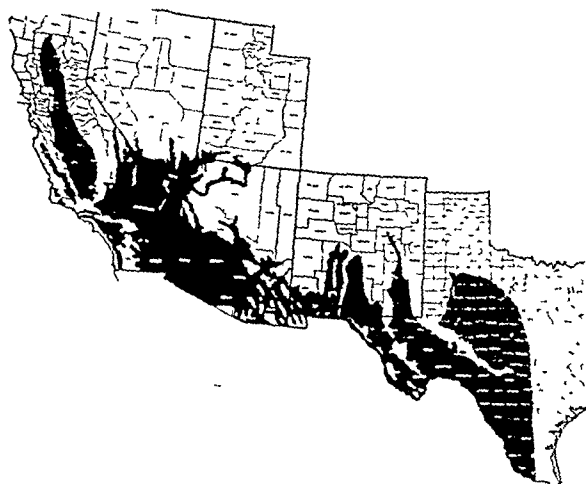
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The Lower Sonoran Life Zone in Arizona

reaches its coldest limits at just above 5,000 feet altitude in most parts of the State. However, the upper limits of the zone are affected somewhat by the latitude and the general slope of the land. Table 2 reveals the gradual drop in conversion rates as the altitude increases above 2,000 feet. The areas of the State that are below 1,000 feet have high January and July temperatures, but also have low rainfall, usually averaging less than 5 inches per year. These areas appear to be too dry for good propagation of this fungus.

Land below 5,000 feet altitude along the Little Colorado River between Cameron and Joseph City is indicated as Lower Sonoran in figures 2 and 3. This was classified at one time as Lower Sonoran (25) but later was dropped (26). Since the only positive animals found in Navajo County were 10 animals at Joseph City, fed locally raised feed, we thought it best to indicate the difference of opinion on the extent of the zone in this area (fig. 4). No tests were made on cattle in the Grand or Little Colorado Canyons; consequently, there were no positives found to affect Coconino County data.

Comparison of the data for cattle with those for persons reveals that cattle become infected at about twice the rate for persons living in the same area. A previous Arizona study revealed the tendency for the prevalence of positive skin test reactions of persons to level off after 12 years of exposure (17). In cattle it was found that after 6 years of exposure there was also a marked leveling off. Because of this, all animals beyond 6 years of age were eliminated from this study. This leveling off is no doubt related to the reversions of positives to negatives. The annual conversion rates from negative to positive in a previous study (17) on human beings, as calculated by the Manos method, was a little less than half that found for the cattle in this study when the rates were calculated by the same method.

The annual rate of conversions to positives among cattle (table 1) is almost identical to that found in skin tests of persons in Maricopa, Pima, and Pinal Counties (10, 12, 13) during the first year of exposure. Therefore, the rates for cattle (fig. 3) are indicative of the actual percent of a susceptible human population that becomes infected per year for each county.

Other studies by Maddy on cattle in these same counties in which cattle were coccidioidin tested every few months revealed that the conversion rates to positive were about double those indicated by the annual conversion rates for cattle in this study, using the Manos method. No doubt this also reflects the loss of positives among infected cattle over a period of a few years.

Comparison of data for persons and cattle also indicates that the prevalence of coccidioidin sensitivity of cattle 5 and 6 years of age (fig. 2) is about the same as that found when persons with 12 years or more of exposure in the endemic area are tested.

This study revealed for the first time that the low altitude areas of Yavapai and Mohave Counties and additional areas of Gila County are endemic for coccidioidomycosis. The absence of test results positive only to histoplasmin and haplomyein indicated that all reactions to these two test agents were cross reactions caused by *C. immitis* infections in cattle. Therefore, it is believed that the cattle tested in this study were not infected with *H. capsulatum* or *Haplosporangium parvum*.

In this study fomites, such as feeds raised in endemic areas, did not appear to be good vehicles for transmission of *C. immitis* to cattle in nonendemic areas fed these feeds.

We believe this study has served as an example of how an animal with a limited home range, that also acquires an infection common to man, can be used to delineate the geographic distribution of the infective agent. For instance, if a good blastomycin could be produced, perhaps a skin test survey of home-raised cattle in selected areas of central and eastern United States would also reveal useful ecologic data on blastomycosis.

### Summary

From various areas of each county of Arizona, 11,643 home-raised cattle 1-6 years of age were coccidioidin tested and 2,859, or 24.6 percent, were found to be positive. Whereas previous human skin test surveys have given only indefinite indications of the extent of the endemic areas, this study revealed rather definite boundaries and the relative infectivity of

various parts of the endemic area of the State. The endemic areas were found to be practically co-terminous with the Lower Sonoran Life Zone.

The low altitude areas of Yavapai and Mohave Counties and additional areas of Gila County were established as endemic areas for the first time, and several areas of the State of above 5,500 feet altitude, previously in a suspect classification, were found to be noninfective to cattle.

The annual conversion rates for cattle, calculated by the Manos method, were found to be almost identical with the actual human infection rate per year in those counties where this relationship was studied.

### TECHNICAL NOTE

To calculate the instantaneous annual conversion rates and the annual conversion rates of cattle in this study, the Manos method was used. The plotting of the complements of the sensitivity prevalence rates,  $p$ , against age,  $t$ , on semilogarithm paper in reverse is equivalent to plotting  $\pi$  against  $t$  on ordinary graph paper, where  $\pi = \log \frac{1}{1-p}$ . The slope  $r$  of such a graph at any point is equal to

$\frac{d\pi}{dt}$  which is equal to  $\frac{\frac{dp}{dt}}{1-p}$ , that is, the instantaneous rate of change in prevalence divided by the proportion of negative reactors at that age. If there is no reversion, the slope  $r$  is therefore equal to the instantaneous conversion rate. This is true only in an abstract sense, however, if the conversion rate varies with time.

If  $t$  is expressed in years, then  $r$  is the instantaneous annual conversion rate. It can also be thought of as the annual attack rate, where the attacks that occur on the nonreactors result in conversions, but where some of the attacks occur on animals already positive. The proportion of conversions that would actually be observable in a 1-year period would be equal to  $1 - e^{-r}$ . This quantity is always less than  $r$ , but the difference is small except in highly endemic areas. It is this quantity that is commonly called the annual conversion rate in the literature.

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# Epidemiological Notes

## Deaths from Electric Current

Accidental deaths caused by electric current numbered 1,030 in 1957. Of these, an estimated 650, or 63 percent, resulted from injuries sustained while at work. The category of work injuries with the largest number of deaths, estimated at 150, was that involving contact between the booms of cranes or similar machines and high-tension wires. Decedents in these accidents included helpers and other workers who were holding guy wires or were otherwise in contact with the machines, as well as operators.

The item on the death certificate asking for the decedent's usual occupation yields minimal data because of the frequent use of general terms such as "maintenance worker" or "laborer." About 120 of the decedents, however, were listed as linemen, with another 120 reported as electricians. While persons in these occupations have a higher than average exposure to lethal voltages, they probably have a greater than average awareness of the haz-

ards and have received more comprehensive safety training concerning electricity than most other workers. Nonetheless, the fatalities represented by these occupations contributed roughly 37 percent of work injury deaths from this cause.

The following tabulation, which classifies deaths according to the manner of injury and whether or not injury took place at work, is based on a 10 percent sample of deaths assigned to accidents caused by electric current (category E914, International Lists). Data include only deaths occurring within the continental United States.

Manner of injury	Number of deaths
Work injury:	
Contact of cranes or similar machines with high-voltage lines.....	150
Other work contact with high-voltage lines.....	290
Other specified work injuries.....	120
Unspecified work injuries.....	90
Nonwork injury:	
Electrical tools and equipment, not at work.....	80
Accidents involving household appliances.....	50
Accidental contact at play.....	90
Other specified nonwork injuries.....	80
Unspecified accidents, not stated as work injuries <sup>1</sup> .....	80
Total .....	1,030

<sup>1</sup>Including 20 deaths specified as from nonwork injuries.

—WARREN W. MORSE, analytical statistician, National Office of Vital Statistics, Public Health Service.

# The Philadelphia Plan for Decentralization of Environmental Health Activities

P. W. PURDOM, P.E., M.S.E., M.G.A.

EARLY IN 1958, the Philadelphia Department of Public Health decentralized its environmental health activities, which are performed by personnel operating in 10 health districts, each with about 200,000 residents. Initially, the decentralization move affected environmental health activities related to food and the general environment, and later, industrial hygiene. Radiation, air pollution control, and veterinary public health activities have been retained as central activities because of lack of sufficient trained personnel to staff each district office. Accident prevention has not been decentralized because it is in the early stages of development.

Among the unique features of the decentralization was the special emphasis on democratic processes in the planning stages and on close, informal collaboration between district and central units. Also, a special unit was set up solely for the purpose of resolving questions produced by drastic changes in administration.

The background of this decentralization begins with the proposal for such action several years earlier. At that time, however, sanitation regulations of the Philadelphia Department of Public Health were being extensively revised.

Work practices were undergoing marked changes. A number of new persons were being recruited, and older employees were being re-

assigned. New activities were being added to our work program. Under these conditions uniformity in the interpretation of standards and utilization of common procedures were of paramount interest. We were particularly concerned about the degree of emphasis and enforcement practices in use throughout the city. A measure of similarity in the various districts was imperative. These factors, together with the initiation of new programs, seemed to require strong central direction. At that time all sanitation field personnel, while based in district offices, were under a district supervisor directly responsible to the central environmental health division.

As our programs developed, however, the necessity for these stringent measures decreased. Field personnel became familiar with the standards, and interpretations became more uniform. As the new sanitation district supervisors matured in their jobs, they were naturally given more responsibility for planning and directing the work under their supervision.

Gradually with progress, we found that there were disadvantages to a strong central approach in an area such as ours. As new operations became effective, the central office was swamped with detailed administrative problems coming in from the districts. This took the valuable time of highly trained and experienced individuals in the central office who should have been devoting the greater portion of their effort to planning, evaluating, and directing the programs of environmental health. No time could be given to analysis of what we were doing to improve efficiency.

In addition, community relations of the en-

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*Mr. Purdom is director of the division of environmental health, Philadelphia Department of Public Health. The paper was given in substantially the same form at the meeting of the American Public Health Association at Atlantic City, N.J., in October 1959.*

vironmental health programs suffered because we had isolated this activity from the others of the health center. The community generally looked to the district health director to give advice and guidance in the solution of health problems of the district. Since the environmental health programs were under strong central control, the district health director knew very little of what was going on in his area to which he could lend assistance.

### The Decentralization Process

The mechanics whereby the Philadelphia Department of Public Health evolved its plan for administrative decentralization began with the appointment of the Committee on Organization of Local Services. Popularly called the COOLS Committee, it was composed of a district health director, the director of the nursing division, the director of the division of epidemiology, and the administrative assistant to the director of public health services. The director of environmental health was chairman. Through the discussions of this committee the opposing points of view of districts seeking autonomy and central divisions seeking direct control were submerged in the interest of developing the best workable plan for the administration of programs. The director of public health services later adopted almost the complete report of this committee in the plan for administrative decentralization of operations.

What were some of the features of this plan for decentralization? Principally, there was a theory of working together through which an understanding was achieved and a compromise plan developed that was neither district autonomy nor direct central control. The committee also recognized the necessity for program planning and the development of standards on a citywide basis.

For these purposes it was considered that there were major functional groupings: professional direction and operations. Another group of activities might be considered management services, but they are not particularly pertinent to this question of decentralization.

In the plan adopted, the professional direction group was charged with primary responsibility for determining program content and professional methods and for broad supportive

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### Decentralization in Perspective

"APOLLODORUS: There are many difficulties, Socrates. In the first place it would offend against one of the two fundamental principles of democratic administration—the one that says that the superior authority should never interfere with the right of the inferior authority to do the wrong thing.

"SOCRATES: What is that principle called?

"APOLLODORUS: It is the principle of decentralization.

"SOCRATES: You spoke of two fundamental principles, Apollodorus; what is the other?

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—*Lancet*, January 24, 1939.

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professional action. This includes program planning and development, establishment of technical procedures and program standards, evaluation of program performance and effectiveness, consultation service to district directors and their staffs, and the establishment of enforcement control. Members of the professional direction group, representing the central staff of the various divisions, are responsible in their respective areas for such agencywide matters as the establishment of position classes, performance standards, recruitment and appointment, resolution of competitive budget and staff needs, personnel rotation schedules, professional and technical training, and consultation on performance evaluation and discipline of professional district personnel. Also included are relations with other agencies whose area of concern extends beyond district limits, as well as specifications for the content of technical records and materials to be used.

Operational activities under this plan were

to be decentralized where this was feasible through the various district offices in the city. Responsibility for district health operations was decentralized in these instances to bring the service as close as possible to those using it.

Primary responsibility and authority for the execution of field activities were assigned to the district health directors. The districts were made responsible for efficient and coordinated local execution of operations in accordance with established professional techniques and program standards. District operations encompass the initiation of district requests for capital and operating budgets and for personnel and material; accountability for district expenditures, work assignment, and supervision of personnel within districts; performance evaluation and discipline of personnel after appropriate consultation; responsibility for the physical condition of district facilities; development of community relationships within districts; designation of working groups to serve areas within districts, and information and recommendations of programs. The district also relates health and program needs and makes recommendations for the employment of enforcement sanctions where necessary.

It was recognized that certain types or portions of programs might not be amenable to administrative decentralization. These exceptions related to certain research programs, operations in the developmental or testing phase, temporary emergency action, services for which public need and convenience required central office location, activities for special groups or of a highly specialized nature, for which duplication throughout the city was unnecessary or uneconomical.

In order to facilitate the change of structure and to serve the districts, an office of district health operations was created. The director of this office is the line supervisor of the district health directors and is responsible to the director of public health services for their professional direction and supervision. The office of district health operations provides many housekeeping functions for the districts such as control of expenditures and provision of facilities. This office also helps focus attention on district operational problems and assists in their solution.

## Working Together

To further the principle of working closely together, both the personnel in district offices and central divisions have been specifically directed to engage freely in personal and telephone communication with each other. Some might question this as contributing to chaos, but in practice it helps eliminate unnecessary "red tape" and adds to efficiency. It also creates better understanding. Of course, such free communication requires comprehension of relative responsibilities and mutual respect for each other's prerogatives.

This plan has resulted in many benefits to the environmental health program as well as to the department as a whole. The central divisions relieved of direct responsibility for day-to-day operations can now function in program planning, evaluation, and direction. The district health director takes more interest in environmental health problems. The team approach is enhanced as the sanitarians become more involved in the health program in the district.

We anticipated problems arising from a change of this magnitude in administrative operation. When the nature of the problems became apparent, the director of public health services established a general advisory staff council on operations with the power to implement changes in the interests of smoother operations. This council later became known as the Co-Op Council. At present, this group is composed of a district health director, the director of district health operations, the administrative assistant to the director of public health services, the director of the division of nursing, and the chief of the section of maternal and child health. The director of the division of environmental health is the director of the council.

Problems selected for consideration by this council have been those concerned with a principle which might be applicable to other situations of a similar nature; thus the council does not expect to develop standard operating procedures for every conceivable condition. The assumption is that persons at high levels in the department are sufficiently intelligent to extend a principle enunciated in a particular exercise to other situations appearing in the future.



vironmental health programs suffered because we had isolated this activity from the others of the health center. The community generally looked to the district health director to give advice and guidance in the solution of health problems of the district. Since the environmental health programs were under strong central control, the district health director knew very little of what was going on in his area to which he could lend assistance.

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Operational activities under this plan were

*On the basis of 3 years' experience with a statewide noncompulsory immunization law for school children, Indiana State health officials predict satisfactory levels of immunization in a few years.*

## A NONCOMPULSORY IMMUNIZATION LAW FOR INDIANA SCHOOL CHILDREN

A. L. Marshall, Jr., M.D.

Andrew C. Offutt, M.D., L.L.D.

IN 1957, a bill was introduced in the Indiana General Assembly calling for compulsory immunization of all children entering school for the first time. Indiana has never had a compulsory immunization law. The bill as introduced provided for immunization of all children against smallpox, diphtheria, tetanus, pertussis, and poliomyelitis.

Fortunately the State health commissioner and members of his staff were called to testify at the committee hearings on the bill. The Indiana State Board of Health has for many years emphasized the need to immunize children between birth and 6 months of age because during this age period the diseases against which protection can be given by immunizing biologicals are the greatest hazard to the young child. All educational efforts with the laity and the medical profession have been directed toward early immunization. The passage of a compulsory law such as the one proposed would tend to cause a reversion to the former practice of sending children to school to be immunized instead of immunizing children before they attend school. It was also pointed out that the decision to obtain protection against disease through immunization must be made by the

individual, his family, and the family physician, and that the decision should be made voluntarily on the basis of the value and benefits to be derived.

The legislators rewrote the entire bill and it became law July 1, 1957, with the following provisions:

The school officials of each school corporation in the State of Indiana shall, upon enrollment of any child for the first time in any school of the school corporation, require the parents, guardian, or any person having the control and custody of such child, if they do not object thereto in writing, to furnish a written statement stating therein whether or not such child has been immunized against smallpox, diphtheria, whooping cough, tetanus or poliomyelitis. The statement shall contain a recital showing the age of such child at the time he received such immunization.

The school officials of the several school corporations of this State shall, not later than sixty days after the enrollment of children for the first time, in any school of the school corporation, file a written report with the Indiana State Board of Health of the Division of Health and Preventive Medicine, and the local health officer having jurisdiction in a manner as may be prescribed by the State board of health, stating in the report the number of such children who have or have not been immunized against smallpox, diphtheria, whooping cough, tetanus or poliomyelitis. The report shall recite the names of the children who have been so immunized and the age when said children received such immunization; and the report shall also recite the names of any children who have not been so immunized. The Indiana State Board of Health shall prescribe and provide the forms on which the school officials shall make such report.

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*Dr. Marshall serves as director of the division of communicable disease control of the Indiana State Board of Health. Dr. Offutt is secretary of the board and State health commissioner.*

Typical of the kind of problems explored and solved by the Co-Op Council are the scheduling of clinics and procedures for inservice training. Under consideration are matters of budget administration, programing, and communications.

### **Anticipated Difficulties**

While these illustrate specific problems which have been tackled in a specific manner, there are other general questions one should anticipate which have to be solved to assure the success of administrative decentralization. Recognition of these issues and their resolution has contributed to the ease of transition in the Philadelphia decentralization.

A point of general concern has been the role of the office of district health operations. It is difficult in the establishment of an office such as this to avoid duplication of the staffs of the various central divisions. Since such an office is in a line position with respect to the district health directors, there is a tendency to assume directory responsibility for formulation of programs. As the personnel in the central divisions are the most competent in the department in their respective fields, it seems important to preserve their responsibility for program direction. Accordingly, the function of the office of district health operations should be that of service. Recognition by the director of district health operations of this role of service rather than of program formulation is important in the establishment of the proper working relationship.

Another area of understanding involves the relative roles of central program directors and the district health directors responsible for operations. It is difficult for the district director to recognize his position as administrator and to submerge a tendency to exercise his

technical competence regarding standards and procedures. He should recognize that he is now an administrator and function in this capacity. A great deal of friction can be avoided if this individual refrains from passing on the validity of technical standards and procedures. While he may question some of the directives given to him, he should accept the final decision.

On the other hand, the central program directors should not operate in ivory towers. They must have information and comments from district personnel in order to be apprised of the citywide problems. The district workers are in a position through experience and intimate community contact to know which programs are workable and which impracticable. In program planning these persons must be consulted and their views considered by the central programming personnel.

It is difficult for the central program director to surrender his privilege of directing daily operations. There is a tendency for him to feel that direct supervision is necessary in order to obtain his objectives. It requires considerable maturity on the part of the program director to recognize that he can multiply his efforts by concentrating them in the area where he is best qualified, and permitting others to carry out the day-to-day operations according to his plan.

The most fundamental issue in the introduction of a drastic change of this type is its acceptance by personnel at all levels. In looking back over our experience, we believe that acceptance has been enhanced by the work of the COOLS Committee and the Co-Op Council. The personnel at least know that their points of view have been considered, whether accepted or not. The discussions, while they may not always have brought agreement, have in most instances developed understanding.

law has been in operation shows some slight improvement in the status of immunization against all preventable diseases (table 1).

### The Monthly Bulletin

Following each year's tabulation a short article is written for the *Monthly Bulletin*, a publication of the Indiana State Board of Health. Accompanying each of these articles are charts indicating the percent of first graders immunized in each county. Counties with less than a 70 percent level of immunity are shaded; others are white.

The results of 3 years' experience have shown that parents have to answer their children when they ask: "Why haven't I had small-pox or polio shots?" After the second annual report in the *Monthly Bulletin*, parents began to take action in their PTA groups, through their local health departments, and through other civic groups to raise the immunization standards in their communities so that their county will appear white on the State chart.

The State's citizens have been taking steps to help themselves. The Indiana State Medical Association went on record in 1955 as opposed to the general principle of mass immunization except in times of emergency or disaster. In many areas where the number of first grade pupils protected against preventable diseases was shockingly low, the physicians were as surprised and concerned as the parents. In fact, during the last 6 months, mass immunizations have been planned in several areas by the local health department and the parents with the sanction and cooperation of the local medical society. These programs for the most part are

paid for from local funds, as the State board of health under existing statutes can provide biologicals only for the indigent. The State board of health has been able to assist in some of these programs by an arrangement whereby the pharmaceutical house holding the State contract for biologicals sells to local health departments immunizing biologicals at the State price. The State medical society has taken cognizance of the problem by urging physicians to take steps to promote immunizations in their offices. The number of counties achieving higher immunization levels has increased (table 2).

The figures for the third year's report are in the printer's hands. It is expected that the publication of the *Monthly Bulletin* carrying these data will stimulate even greater local activity than evidenced by the second year's report.

### Conclusion

There has been a movement in the United States in the past 2 years to make immunization compulsory upon entering school. The Indiana State Board of Health feels not only that the compulsory aspect will discourage immunizations early in life but that the preservation of health is an individual or family responsibility. Based upon the short experience with the Indiana law it is believed that within a relatively few years this type of legislation will result in the achievement of a satisfactory immunization level for children in all counties of the State. This experience with a noncompulsory immunization law may be of benefit to States in which pressure groups are clamoring for compulsory immunization.

**Table 1. Percentage of Indiana pupils beginning school immunized against diseases covered in the State's immunization law of 1957, as reported to the State board of health**

Year	Pupils	Smallpox	Diphtheria	Tetanus	Whooping cough	Poliomyelitis
1957	104,949	65	72	71	71	67
1958	100,713	64	73	71	71	69
1959	99,843	67	75	75	74	73

### Data Gathering

Many of the schools in Indiana were already using a questionnaire which was filled out by the parent or guardian of each child entering school for the first time. This included questions on immunization. Letters were sent by the Indiana State Board of Health to the superintendent of each school system in the State asking them to include such questions in their entrance questionnaire.

The principal of each school was asked by the superintendent of schools to report the number of pupils entering school for the first time and the number who were satisfactorily immunized against poliomyelitis, pertussis, diphtheria, tetanus, and smallpox. A sample form was sent to each school principal indicating the manner in which the data should be presented when reported to the school superintendent. It was left to the decision of each superintendent as to whether his principals would be sup-

plied printed forms for this report or whether the information was to be transmitted by letter.

The Indiana State Board of Health supplies a form in triplicate to the school superintendents. On this form the superintendent lists all of the schools under his control. Pertinent data are given as to the number of pupils entering school for the first time and the number satisfactorily immunized against each disease named in the law. The original copy of the form is sent to the State board of health and the second copy to the local health officer. The third copy is retained by the school superintendent.

The communicable disease control division of the Indiana State Board of Health receives these reports, collates them, and publishes an annual report of the State by counties. Copies are mailed to every school superintendent and local health officer in the State. The report for the calendar year 1959 has just been completed. A summary of the totals for the 3 years the

**Table 2. Status of immunization as reported by counties in Indiana, by percent of immunized first graders in public and parochial schools**

Percent of first graders immunized	Number of counties reporting														
	Smallpox			Diphtheria			Tetanus			Pertussis			Poliomyelitis		
	1957	1958	1959	1957	1958	1959	1957	1958	1959	1957	1958	1959	1957	1958	1959
20-30	5	2	2					1			1				
30-40	10	8	5		1	1	2		1	2		1	2	1	1
40-50	16	17	12	5	3	2	8	5	2	4	2	1	6	3	1
50-60	22	21	19	13	11	7	13	9	9	14	15	6	23	11	4
60-70	24	22	25	25	27	21	30	30	18	32	32	21	31	40	27
70-80	11	14	22	38	37	37	28	35	40	30	29	11	22	28	39
80-90	2	6	5	9	9	21	9	10	18	9	11	19	4	8	19
90-100	1	1	2	1	3	3	1	1	4		1	3			1
Total	91	91	92	91	91	92	91	91	92	91	91	92	91	91	92

Note: Brown County gave no reports for 1957 and 1958.

• Lack of attention or treatment during "dry periods."

In maintaining an adequate inspection program, there must be complete cooperation between the dairyman, the veterinarian, the processor, and the health department. Neither the prevalence of mastitis nor economic losses can be significantly reduced by treatment of acute cases alone. Any effective program for the control of mastitis must be based on consideration of the total herd.

### Recommended Preventive Program

A routine, continuous check or supervision system by a qualified individual has been applied in some of the larger dairies and has proved both successful and profitable. It provides periodic examination of all milking and dry cows in the herd, including all aspects of prevention, diagnosis, and treatment. If a similar system could be applied in the smaller dairies, it should be equally effective. Factors to consider in the continuous check system are:

*Biological factors.* One infected cow in a herd constitutes a potential hazard, and laboratory examination is essential to determine the etiological agent and effectively cope with it.

*Environmental factors.* For the most part, environmental factors which influence the health of the herd may be controlled by the application of good sanitation and milking practices as well as by properly designed and maintained equipment. The health of workers who have close contact with the herd must be considered also in an effort to prevent transmission of infections from man to animal.

*Herd management.* The dairying operation should be planned to provide satisfactorily constructed housing and equipment which will

lend itself to effective sanitation measures with the most efficient use of labor. Replacement stock should be carefully selected to minimize the opportunities of introducing infection into the milking herd. Such a continuous program, with careful attention to feeding and milking practices, is essential in the maintenance of a healthy herd.

Infected herds should be followed closely until prevalence of disease and losses are reduced to a minimum. Otherwise, visits to the herds should be scheduled at regular intervals so as to maintain this minimum rate.

Such a system of professional care will assure identification of chronic and acute cases, accurate diagnosis, advice on procedures and continuing remedial measures for infected herds, and specific treatment for infected cows. Also, it will provide dairymen with long-range advice on heredity, breeding programs, nutrition, and other factors related to herd health. A healthy herd assures wholesome, good quality milk and thus reduces public health hazards and economic losses.

### Preventive Methods

#### Effective Controls

Institute a periodic examination by a veterinarian of all milking and dry cows in the herd:

1. To determine general health of each cow.
2. To examine udder for lumps and injuries.
3. To collect milk samples from all cows in the milking string for laboratory examination.
4. To discuss and advise on herd practices, sanitation, nutrition, and other factors related to mastitis prevention and control.

#### Segregation of Infected Animals

Isolate cows with mastitis and milk separately (if practical) or milk cows in the following order:

1. Cows with no evidence of mastitis.
2. Cows with normal udders, but shedding mastitis bacteria as shown by culture of milk samples.

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### Infectious Causes

*Streptococcus agalactiae*  
*Streptococcus dysgalactiae*  
*Streptococcus pyogenes*  
*Staphylococcus aureus*  
*Escherichia coli*  
*Acrobacter anogenus*  
*Klebsiella pneumoniae*

*Pseudomonas aeruginosa*  
*Corynebacterium pyogenes*  
*Pasteurella multocida*  
*Clostridium perfringens*  
*Nocardia asteroides*  
*Cryptococcus neoformans*  
*Mycobacterium bovis* (tuberculosis)

*Paracolon bacteria*  
*Salmonella serotypes*  
*Actinomyces bovis*  
*Brucella abortus*  
*Brucella melitensis*  
*Leptospira pomona*

## Bovine Mastitis

**I**N SPITE of improvements in dairy husbandry practices, the availability of a wider range of therapeutic agents, and the efforts of health and agriculture authorities toward control, bovine mastitis continues as a major problem in the dairy industry. The problem is twofold, encompassing both public health hazards to man and economic losses to the dairyman.

A variety of micro-organisms that produce disease in man also inhabit the bovine udder and cause mastitis. Although certain streptococci and staphylococci are considered to be the primary infectious causes of mastitis, numerous other organisms have been shown to be involved, such as *Escherichia coli*, *Corynebacterium pyogenes*, *Pasteurella multocida*, *Mycobacterium bovis*, and many others (see list of infectious causes).

Human infection may result from direct contact with the infected animal or consumption of raw or inadequately pasteurized milk containing pathogenic organisms. Of further public health importance are the staphylococcal enterotoxins in milk which are not destroyed by pasteurization. As a result, fluid milk, dried milk, and cheese have been incriminated in outbreaks of food poisoning in man.

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*These recommendations were prepared by Dr. James H. Steele, chief, and Dr. Raymond Zinn, Dr. Robert Courter, and Mildred M. Galton of the Veterinary Public Health Section, Communicable Disease Center, Public Health Service, with the advice of Dr. William Pounden, Ohio Agricultural Experimental Station, Wooster; Dr. John Helwig, Dr. David Jones, and Dr. Charles Reid, Department of Preventive Veterinary Medicine, Ohio State University, Columbus; and Dr. Joe W. Atkinson, Milk and Food Program, Public Health Service.*

It has been demonstrated also that milk from cows with mastitis is low in nutritional value and quality. During the past decade the widespread use of antibiotic therapy in mastitis, with the resultant antibiotic residues in milk and milk products from these treated animals, has presented still another possible health hazard. Nonsensitive individuals may become sensitized and hypersensitive persons may have reactions.

Also of importance is the economic loss caused by bovine mastitis, which is estimated to be more than a quarter of one billion dollars annually. This loss is due to lower milk production, a reduction in the productive life of the affected cows, mortality of some animals, and, finally, the expense of veterinary services and drugs.

### Predisposing Causes

There are many predisposing or initiating causes of bovine mastitis that are difficult to control, particularly in the small herds where dairying is only one of several farming activities. Such contributing factors include:

- Sloppy, muddy barnyards.
- Unsanitary milking barns.
- Inadequate, drafty shelter.
- Injuries or bruises caused by faulty milking machines, freezing or chapping of teats, and structural features such as high doorsills, narrow, short stalls, protruding nails, and poor fences.
- Improper milking practices such as incomplete or irregular milking, unclean machines, failure to dip teat cups after use on each cow, inaccurate pressure gauge or pressure too high for type of teat cup used, leaving machine on cow too long, failure to segregate cows, milking cows in improper order, improper cleansing of cow before milking, and "wet stripping"
- Physical abnormalities of udder or teats.
- Age of cow.
- Hereditary factors.

# Milk Sanitation Honor Roll for 1958-60

Fifty communities have been added to the Public Health Service milk sanitation "honor roll," and 74 communities on the previous list have been dropped. This revision covers the period from July 1, 1958, to June 30, 1960, and includes a total of 281 cities and 90 counties.

Communities on the honor roll have complied substantially with the various items of sanitation contained in the milk ordinance recommended by the U.S. Public Health Service. The State milk sanitation authorities concerned report this compliance to the Service. The rating of 90 percent or more, which is necessary for inclusion on the list, is computed from the weighted average of the percentages of compliance. Separate lists are compiled for communities in which all market milk sold is pasteurized, and for those in which both raw milk and pasteurized milk are sold.

The recommended milk ordinance, on which the milk sanitation ratings are based, is now in effect through voluntary adoption in 496 counties and 1,426 municipalities. The ordinance also serves as the basis for the regulations of 36 States. In 16 States it is in effect statewide.

The ratings do not represent a complete measure of safety, but they do indicate how closely a community's milk supply conforms with the standards for grade A milk as stated in the recommended ordinance. High-grade pasteurized milk is safer than high-grade raw milk because of the added protection of pasteurization. The second list, therefore, shows the percentage of pasteurized milk sold in a community which also permits the sale of raw milk.

Although semiannual publication of the list is intended to encourage communities operating under the rec-

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*This compilation is from the Milk and Food Program, Division of Engineering Services, Public Health Service. The previous listing was published in Public Health Reports, April 1960, pp. 371-374. The rating method is described in PHS Publication No. 678 (Methods of Making Sanitation Ratings of Milksheds).*

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ommended ordinance to attain and maintain a high level of enforcement of its provisions, no comparison is intended with communities operating under other milk ordinances. Some communities might be deserving of inclusion, but they cannot be listed because no arrangements have been made for determination of their ratings by the State milk sanitation authority concerned. In other cases, the ratings which were submitted have lapsed because they are more than 2 years old. Still other communities, some of which may have high-grade milk supplies, have indicated no desire for rating or inclusion on this list.

The rules for inclusion of a community on the honor roll are:

1. All ratings must be determined by the State milk sanitation authority in accordance with the Public Health Service rating method, which is based on the grade A pasteurized milk and the grade A raw milk requirements of the Public Health Service recommended milk ordinance.

2. No community will be included on the list unless both its pasteurized milk and its retail raw milk ratings are 90 percent or more.

Communities in which only raw milk is sold will be included if the retail raw milk rating is 90 percent or more.

3. The rating used will be the latest submitted to the Public Health Service, but no rating will be used which is more than 2 years old. (In order to promote continuous rigid enforcement rather than occasional "cleanup campaigns," it is suggested that, when the rating of a community on the list falls below 90 percent, no resurvey be made for at least 6 months. This will result in the removal of the community from the subsequent semiannual list.)

4. No community will be included on the list whose milk supply is not under an established program of official routine inspection and laboratory control provided by itself, the county, a milk-control district, or the State. (In the absence of such an official program, there can be no assurance that only milk from sources rating 90 percent or more will be used continuously.)

5. The Public Health Service will make occasional check surveys of cities for which ratings of 90 percent or more have been reported by the State. (If the check rating is less than 90 percent, but not less than 85, the city will be removed from the 90-percent list after 6 months unless a resurvey submitted by the State during this probationary period shows a rating of 90 percent or more. If the check rating is less than 85 percent, the city will be removed from the list immediately. If the check rating is 90 percent or more, the city will be retained on the list for 2 years from the date of the check survey, unless a subsequent rating during this period warrants its removal.)



3. Cows with udders showing some physical evidence of past or present mastitis.

4. Cows with acutely affected or badly damaged udders as a result of severe infections.

#### *Disposition of Mastitic Mammary Secretions*

In all cases of disease, suspected disease, or treatment, obtain the advice of the veterinarian on disposition of milk from the affected cows.

1. Dispose of mammary secretions abnormal in appearance or from obviously infected quarters so they are not accessible to animals or used in any way for human consumption.

2. Discard from market milk supply secretion from quarters infused with antibiotics for at least 72 hours following last infusion.

#### *Sanitation and Good Milking Practices*

1. Avoid sloppy and muddy barnyards.

2. Maintain milking barn in clean condition.

3. Keep the udder trimmed of long hair.

4. Have a regular milking schedule.

5. About 1 minute before milking, wash udder with a warm solution containing at least 200 ppm available chlorine. Use a separate clean towel and do not dip or place a used towel back in the solution.

6. Use a strip cup or plate.

7. Use the milking machine properly; follow manufacturer's instructions.

8. Keep teat cup liners clean and in good repair.

9. Put machine on cow as soon as the "let down" occurs; take it off as soon as the milk is removed from the udder.

10. Strip rapidly by machine or hand.

11. Immediately after milking, dip teats in an approved mild antiseptic solution or swab teat ends with mild antiseptic.

12. After removal from each cow, dip teat cups in lukewarm water or antiseptic solution, then in a fresh warm chlorine (200 to 250 ppm) or other approved antiseptic solution.

13. Wash hands frequently; do not permit "wet-hand" milking.

14. Disinfect stalls where cows with mastitis are kept.

#### *Good Herd Management*

1. Use home-raised heifers as replacements; or have each purchased replacement thoroughly examined by a veterinarian, have milk samples from each quarter of the udder analyzed, and isolate the animal until sure she is free of mastitis.

2. Construct milking barn to allow plenty of standing room; have no steps at all or very low steps at doorways.

3. Keep barnyards, barn, and pastures free of mud, trash, debris, machinery, and other sources of filth or injury.

4. Be sure stall beds are of adequate size, neither too narrow nor too short, with partitions or curbs between cows.

5. Provide plenty of clean bedding, preferably straw or a mixture containing straw.

6. Clean and disinfect cow beds periodically.

7. Drying off cows:

(a) Reduce grain and water intake of heavy producers.

(b) Stop milking, except to relieve the udder when it seems too full.

(c) If mastitis is present, keep pus or infected secretions milked out; treat.

(d) Allow 8 weeks as a minimum dry period, and as much as 3 months for cows known to have had mastitis.

(e) Observe frequently during the dry period, and obtain veterinary advice and treatment when needed.

8. Remove from the herd cows which are in heat to prevent the animals from mounting each other and bruising their udders.

9. Do not allow calves to suck each other.

10. Do not feed calves raw milk from cows with mastitis.

11. Feed calves pasteurized milk.

12. Reduce the concentrated feed intake of a cow with mastitis.

13. Be sure that diagnosis is specific, that treatment is correct, effective in amount, and continued for sufficient length of time, and that all other needed remedial action is carried out for prevention of mastitis within the entire herd.

**Communities awarded milk sanitation ratings of 90 percent or more, July 1958-June  
1960—Continued**

<i>Community</i>	<i>Date of rating</i>	<i>Community</i>	<i>Date of rating</i>	<i>Community</i>	<i>Date of rating</i>
<i>Mississippi—Continued</i>		<i>North Carolina—Continued</i>		<i>Tennessee—Continued</i>	
Greenville .....	10-21-1958	Harnett County .....	10-15-1958	Lexington .....	10-30-1958
Greenwood .....	2- 2-1960	Haywood County .....	3-30-1960	Livingston .....	1- 7-1959
Grenada .....	9-17-1959	Henderson County .....	10-20-1958	Manchester .....	10-15-1958
Gulfport .....	10- 8-1959	Hertford County .....	7-31-1958	Maryville and Alcoa .....	3-29-1960
Hattiesburg .....	2-23-1960	Iredell County .....	12-11-1959	Memphis .....	8-18-1959
Hernando .....	12-19-1958	Jackson County .....	3-19-1959	Milan .....	11-11-1958
Houston .....	4-15-1959	Lee County .....	4-26-1960	Morristown .....	7-10-1958
Iuka .....	4- 8-1959	Lenoir County .....	4- 7-1959	Mountain City .....	10-28-1958
Jackson .....	3-26-1959	Lincoln County .....	1- 9-1959	Murfreesboro .....	7-21-1959
Laurel .....	3-17-1960	Macon County .....	3-19-1959	Nashville-Davidson County .....	10-21-1959
Louisville .....	8-18-1958	Martin County .....	8-13-1958	Newbern .....	11-18-1958
Meadville .....	2-25-1959	Mecklenburg County .....	10-23-1959	Paris .....	9- 4-1958
Meridian .....	11-18-1959	Montgomery County .....	4- 7-1960	Pulaski .....	8- 3-1959
New Albany .....	8-27-1959	Nash County .....	10-14-1959	Sweetwater .....	9-23-1958
Oxford .....	7- 2-1959	New Hanover County .....	12-10-1959	Trenton .....	11- 5-1958
Picayune .....	6-11-1959	Northampton County .....	7-31-1958	Tulahoma .....	10-13-1958
Starkville .....	2-10-1959	Onslow County .....	5-13-1959	Waverly .....	8-26-1958
State College .....	2-11-1959	Pamlico County .....	8-28-1959	Winchester .....	10-16-1958
Tupelo .....	1-27-1959	Pender County .....	3- 2-1959		
Vicksburg .....	1-27-1959	Richmond County .....	7-30-1958	<i>Texas</i>	
West Point .....	7-15-1958	Rocky Mount .....	10-14-1959	Amarillo .....	4-14-1959
<i>Missouri</i>		Stanly County .....	9-10-1958	Big Spring .....	8-21-1959
Chillicothe .....	8-19-1959	Swain County .....	3-19-1959	Brownfield .....	6- 9-1959
Hannibal .....	8-17-1959	Transylvania County .....	10-20-1958	Brownwood .....	6-29-1959
Kansas City .....	10-27-1959	Tyrrell County .....	2-18-1960	Bryan .....	7-17-1959
St. Joseph .....	1-27-1960	Union County .....	12- 4-1958	Burkburnett .....	8-11-1959
St. Louis .....	6-29-1959	Washington County .....	2-18-1960	College Station .....	7-16-1959
Sikeston .....	12-10-1959	Wayne County .....	11- 5-1959	Corpus Christi .....	5-11-1959
		Wilson County .....	8-28-1959	Dallas .....	11-17-1958
<i>Nebraska</i>		<i>Oklahoma</i>		Denver City .....	6- 8-1959
Lincoln .....	7-16-1958	Mangum .....	11-12-1959	Edinburg .....	1-25-1960
<i>Nevada</i>		Okmulgee .....	10-16-1959	El Paso .....	9-11-1959
Clark, Nye, and Lincoln Counties .....	5-18-1959	Tulsa .....	6-15-1959	Falfurrias .....	9-10-1959
<i>New Mexico</i>		<i>Tennessee</i>		Fort Worth .....	5-28-1959
Albuquerque .....	9-11-1958	Athens .....	9- 3-1959	Gonzales .....	7-24-1959
<i>North Carolina</i>		Chattanooga-Hamilton County .....	10- 9-1958	Grand Prairie .....	11-28-1958
Alexander County .....	1- 9-1959	Cleveland .....	9- 2-1959	Greenville .....	12-12-1958
Beaufort County .....	5-14-1959	Clinton .....	9-16-1958	Harlingen .....	9-10-1959
Burke County .....	4-27-1960	Covington .....	12-12-1958	Jacksonville .....	12-17-1958
Catawba County .....	1- 9-1959	Cowan .....	10-16-1958	Kingsville .....	5- 6-1959
Craven County .....	7-24-1959	Decherd .....	10-16-1958	Levelland .....	6-11-1959
Cumberland County .....	11-27-1959	Dyersburg .....	11-18-1958	Lubbock .....	8-14-1958
Durham County .....	12-18-1959	Erwin .....	10-30-1958	Lufkin .....	7- 9-1958
Edgecombe County .....	9-10-1959	Greeneville .....	4-27-1960	McAllen .....	1-26-1960
Forsyth County .....	12-12-1958	Humboldt .....	11- 5-1958	Mercedes .....	1-26-1960
Gates County .....	7-31-1958	Huntingdon .....	10-28-1958	Midland .....	8-21-1959
Guilford County .....	11-20-1959	Jackson-Madison County .....	10-14-1958	Mineral Wells .....	7-10-1959
Hallfax County .....	6-22-1959	Kingsport .....	1-20-1960	Odessa .....	8-21-1959
		Knoxville .....	5- 6-1959	Paris .....	3-11-1960
				Plainview .....	10- 8-1958
				San Angelo .....	9- 4-1959
				San Antonio .....	3- 6-1959

# Communities awarded milk sanitation ratings of 90 percent or more, July 1958-June 1960

## 100 PERCENT OF MARKET MILK PASTEURIZED

<i>Community</i>	<i>Date of rating</i>	<i>Community</i>	<i>Date of rating</i>	<i>Community</i>	<i>Date of rating</i>
<i>Arkansas</i>		<i>Indiana—Continued</i>		<i>Kentucky—Continued</i>	
Fort Smith.....	8- 7-1959	Monticello .....	10-16-1958	Frankfort .....	10- 8-1959
<i>Colorado</i>		North Manchester.....	12-16-1958	Fulton and Fulton	
Boulder County.....	5.....1960	Peru .....	10-30-1958	County .....	8-12-1959
Denver and Denver		Rochester .....	9-17-1958	Glasgow .....	1-17-1959
County .....	5.....1959	Warsaw .....	8-15-1958	Georgetown and Scott	
Las Animas-Huerfano		<i>Iowa</i>		County .....	10- 9-1959
Counties .....	1.....1960	Ames .....	3-15-1960	Greenville .....	3-30-1960
Pueblo County.....	8-13-1959	Anamosa .....	12- 9-1959	Hardinsburg and Breck-	
Weld County.....	7-23-1959	Atlantic .....	10- 7-1959	inridge County.....	10-22-1958
<i>District of Columbia</i>		Boone .....	3- 4-1960	Henderson County.....	7-10-1959
Washington .....	12-11-1959	Burlington .....	3-17-1960	Hodgenville .....	10-20-1958
<i>Georgia</i>		Cedar Falls.....	11-25-1959	Hopkinsville and Chris-	
Albany .....	12- 5-1958	Cedar Rapids.....	10- 9-1958	tian County.....	4-21-1960
Athens .....	5- 8-1959	Clarion .....	10-22-1959	Jessamine County.....	6-17-1959
Atlanta .....	8- 6-1959	Clinton .....	8-27-1959	Liberty .....	11-18-1958
Augusta .....	5-23-1959	Corydon .....	2- 2-1960	Louisville and Jefferson	
Brunswick .....	11- 9-1959	Davenport .....	7-24-1958	County .....	12-11-1959
Cairo .....	3-22-1960	Des Moines .....	7- 3-1958	Lyon County.....	3- 1-1960
Calhoun-Gordon County..	8-12-1958	Dyersville .....	12- 8-1959	Mayfield and Graves	
Canton .....	10-30-1958	Eagle Grove.....	10-19-1959	County .....	5- 6-1959
Columbus .....	1-23-1959	Estherville .....	7- 8-1959	McLean County.....	3-28-1960
Dalton .....	2- 5-1960	Fort Dodge.....	7-29-1959	Morehead .....	2- 3-1959
Douglas County.....	7-25-1958	Grinnell .....	7- 1-1959	Morgantown .....	11-24-1959
Fitzgerald .....	5-27-1959	Humboldt .....	10-20-1959	Mount Sterling.....	6-16-1959
La Grange.....	10- 8-1958	Iowa City.....	10- 9-1958	Murray and Calloway	
Moultrie .....	12-10-1959	Le Mars.....	1-28-1960	County .....	1- 7-1960
Paulding County.....	7-25-1958	Lytton .....	10-21-1959	Newport and Campbell	
Quitman .....	3-16-1960	Maquoketa .....	12- 9-1959	County .....	9-18-1959
Rome-Floyd County....	8- 6-1959	Marshalltown .....	10-21-1959	Owensboro .....	2- 5-1960
Savannah .....	7-18-1958	Mason City.....	1-20-1960	Owingsville .....	6-16-1959
Thomasville .....	3-18-1960	Pocahontas .....	10-20-1959	Paducah and McCracken	
Valdosta .....	12- 9-1959	Rockwell City.....	10-21-1959	County .....	5- 1-1959
Waycross .....	3-11-1960	Spencer .....	2-26-1960	Paris and Bourbon	
<i>Illinois</i>		Storm Lake.....	10-14-1959	County .....	6-15-1959
Chicago .....	5- 4-1959	Waterloo .....	11-20-1959	Pike County.....	7-22-1958
Elgin .....	9-19-1958	Webster City.....	10-19-1959	Prestonsburg and Floyd	
Joliet .....	3-27-1959	<i>Kentucky</i>		County .....	7-22-1958
<i>Indiana</i>		Ashland and Boyd		Russellville .....	2- 2-1960
Anderson .....	12- 3-1958	County .....	7-23-1959	Smithland and Livings-	
Berne-Bluffton area....	10-17-1958	Bell County.....	8- 4-1959	ton County.....	3- 1-1960
Fort Wayne.....	7-15-1958	Benton .....	3- 2-1960	<i>Mississippi</i>	
Frankfort .....	2-10-1959	Bowling Green and War-		Amory .....	5- 7-1959
Huntington .....	1-14-1959	ren County.....	5-14-1959	Biloxi .....	10- 8-1959
Kokomo .....	2-10-1959	Campbellsville .....	2-13-1959	Booneville .....	5- 6-1959
Madison .....	7-23-1958	Corvinton .....	5-28-1959	Brookhaven .....	1-26-1960
		Danville and Boyle		Canton .....	9-30-1958
		County .....	2-11-1960	Clarksdale .....	12-17-1958
		Elizabethtown and Har-		Columbia .....	8- 7-1958
		din County.....	11-23-1959	Columbus .....	7-16-1958
				Corinth .....	4- 9-1959
				Eupora .....	9-24-1959

**Communities awarded milk sanitation ratings of 90 percent or more, July 1958-June 1960—Continued**

<i>Community</i>	<i>Date of rating</i>	<i>Community</i>	<i>Date of rating</i>	<i>Community</i>	<i>Date of rating</i>
<i>Mississippi—Continued</i>		<i>North Carolina—Continued</i>		<i>Tennessee—Continued</i>	
Greenville -----	10-21-1958	Harnett County-----	10-15-1958	Lexington -----	10-30-1958
Greenwood -----	2- 2-1960	Haywood County-----	3-30-1960	Livingston -----	1- 7-1959
Grenada -----	9-17-1959	Henderson County-----	10-20-1958	Manchester -----	10-15-1958
Gulfport -----	10- 8-1959	Hertford County-----	7-31-1958	Maryville and Alcoa---	3-29-1960
Hattiesburg -----	2-23-1960	Iredell County-----	12-11-1959	Memphis -----	8-18-1959
Hernando -----	12-19-1958	Jackson County-----	3-19-1959	Milan -----	11-11-1958
Houston -----	4-15-1959	Lee County-----	4-26-1960	Morristown -----	7-10-1958
Iuka -----	4- 8-1959	Lenoir County-----	4- 7-1959	Mountain City-----	10-28-1958
Jackson -----	3-26-1959	Lincoln County-----	1- 9-1959	Murfreesboro -----	7-21-1959
Laurel -----	3-17-1960	Macon County-----	3-19-1959	Nashville-Davidson	
Louisville -----	8-18-1958	Martin County-----	8-13-1958	County -----	10-21-1959
Meadville -----	2-25-1959	Mecklenburg County----	10-23-1959	Newbern -----	11-18-1958
Meridian -----	11-18-1959	Montgomery County----	4- 7-1960	Paris -----	9- 4-1958
New Albany-----	8-27-1959	Nash County-----	10-14-1959	Pulaski -----	8- 3-1959
Oxford -----	7- 2-1959	New Hanover County*	12-10-1959	Sweetwater -----	9-23-1958
Picayune -----	6-11-1959	Northampton County----	7-31-1958	Trenton -----	11- 5-1958
Starkville -----	2-10-1959	Onslow County-----	5-13-1959	Tulahoma -----	10-13-1958
State College -----	2-11-1959	Pamlico County-----	8-28-1959	Waverly -----	8-26-1958
Tupelo -----	1-27-1959	Pender County-----	3- 2-1959	Winchester -----	10-16-1958
Vicksburg -----	1-27-1959	Richmond County-----	7-30-1958		
West Point-----	7-15-1958	Rocky Mount-----	10-14-1959	<i>Texas</i>	
<i>Missouri</i>		Stanly County-----	9-10-1958	Amarillo -----	4-14-1959
Chillicothe -----	8-19-1959	Swain County-----	3-19-1959	Big Spring -----	8-21-1959
Hannibal -----	8-17-1959	Transylvania County----	10-20-1958	Brownfield -----	6- 9-1959
Kansas City-----	10-27-1959	Tyrrell County-----	2-18-1960	Brownwood -----	6-29-1959
St. Joseph-----	1-27-1960	Union County-----	12- 4-1958	Bryan -----	7-17-1959
St. Louis-----	6-29-1959	Washington County----	2-18-1960	Burkburnett -----	8-11-1959
Sikeston -----	12-10-1959	Wayne County-----	11- 5-1959	College Station-----	7-16-1959
		Wilson County-----	8-28-1959	Corpus Christi-----	5-11-1959
<i>Nebraska</i>		<i>Oklahoma</i>		Dallas -----	11-17-1958
Lincoln -----	7-16-1958	Mangum -----	11-12-1959	Denver City-----	6- 8-1959
<i>Nevada</i>		Okmulgee -----	10-16-1959	Edinburg -----	1-25-1960
Clark, Nye, and Lincoln		Tulsa -----	6-15-1959	El Paso-----	9-11-1959
Counties -----	5-18-1959			Falfurrias -----	9-10-1959
<i>New Mexico</i>		<i>Tennessee</i>		Fort Worth-----	5-28-1959
Albuquerque -----	9-11-1958	Athens -----	9- 3-1959	Gonzales -----	7-24-1959
<i>North Carolina</i>		Chattanooga-Hamilton		Grand Prairie-----	11-28-1958
Alexander County-----	1- 9-1959	County -----	10- 9-1958	Greenville -----	12-12-1958
Beaufort County-----	5-14-1959	Cleveland -----	9- 2-1959	Harlingen -----	9-10-1959
Burke County-----	4-27-1960	Clinton -----	9-16-1958	Jacksonville -----	12-17-1958
Catawba County-----	1- 9-1959	Covington -----	12-12-1958	Kingsville -----	5- 6-1959
Craven County-----	7-24-1959	Cowan -----	10-16-1958	Levelland -----	6-11-1959
Cumberland County----	11-27-1959	Decherd -----	10-16-1958	Lubbock -----	8-14-1958
Durham County-----	12-18-1959	Dyersburg -----	11-18-1958	Lufkin -----	7- 9-1958
Edgecombe County-----	9-10-1959	Erwin -----	10-30-1958	McAllen -----	1-26-1960
Forsyth County-----	12-12-1958	Greeneville -----	4-27-1960	Mercedes -----	1-26-1960
Gates County-----	7-31-1958	Humboldt -----	11- 5-1958	Midland -----	8-21-1959
Guilford County-----	11-20-1959	Huntingdon -----	10-28-1958	Mineral Wells-----	7-10-1959
Halifax County-----	6-22-1959	Jackson-Madison		Odessa -----	8-21-1959
		County -----	10-14-1958	Paris -----	3-11-1960
		Kingsport -----	1-20-1960	Plainview -----	10- 8-1958
		Knoxville -----	5- 6-1959	San Angelo-----	9- 4-1959
				San Antonio-----	3- 6-1959

Communities awarded milk sanitation ratings of 90 percent or more, July 1958-June 1960—Continued

<i>Community</i>	<i>Date of rating</i>	<i>Community</i>	<i>Date of rating</i>	<i>Community</i>	<i>Date of rating</i>
<i>Texas—Continued</i>		<i>Virginia—Continued</i>		<i>Wisconsin</i>	
San Benito.....	9-10-1959	Lynchburg .....	4-14-1959	Appleton .....	1-13-1959
Seagraves .....	6- 8-1959	Marion .....	4-22-1959	Beaver Dam.....	2-13-1959
Seminole .....	6- 8-1959	Norfolk .....	6- 3-1960	Burlington .....	12-11-1958
Sweetwater .....	9-25-1959	Petersburg .....	11- 7-1958	Delavan .....	12-11-1958
Texarkana .....	6-24-1959	Portsmouth, .....	3-27-1959	Eau Claire County (Eau Claire, Altoona, Au- gusta, and Fairchild) ..	2- 3-1959
Tyler .....	9-26-1958	Pulaski .....	8- 7-1958	Elkhorn .....	12-11-1958
Victoria .....	1-19-1959	Radford .....	8- 7-1958	Fontana .....	12-11-1958
Wichita Falls.....	10-23-1959	Richmond .....	4-25-1960	Fort Atkinson.....	12-11-1958
		Roanoke .....	7- 3-1958	Kaukauna .....	1- 6-1959
<i>Utah</i>		South Boston.....	5-13-1959	La Crosse.....	8-26-1958
Ogden .....	2-25-1960	Staunton .....	3- 8-1960	Lake Geneva.....	12-11-1958
Utah County.....	3-23-1960	Waynesboro .....	4-21-1960	Neenah-Menasha .....	12- 2-1958
				Oshkosh .....	7- 9-1958
<i>Virginia</i>		<i>Washington</i>		Ripon .....	2-13-1959
Alexandria .....	6-10-1959	Everett .....	10-28-1959	Stevens Point.....	2-19-1959
Blacksburg .....	8- 7-1958	Spokane .....	10-29-1958	Waupun .....	2-13-1959
Christiansburg .....	8- 7-1958	Tacoma .....	8-25-1958	Williams Bay.....	12-11-1958
Colonial Heights.....	11- 7-1958	Whitman County.....	10-17-1958		

## BOTH RAW AND PASTEURIZED MARKET MILK

<i>Community and percent of milk pasteurized</i>	<i>Date of rating</i>	<i>Community and percent of milk pasteurized</i>	<i>Date of rating</i>	<i>Community and percent of milk pasteurized</i>	<i>Date of rating</i>
<i>Arkansas</i>		<i>North Carolina</i>		<i>Texas—Continued</i>	
Little Rock, 99.8.....	10-14-1959	Buncombe County, 99.1..	9-30-1959	Hereford, 97.....	3-27-1959
		Cleveland County, 91.8..	9-11-1958	Laredo, 96.6.....	6- 9-1959
<i>Georgia</i>		Robeson County, 98.2..	2-24-1960	Marshall, 98.8.....	4-23-1959
Americus, 94.9.....	8-25-1958			Palestine, 99.79.....	7-10-1959
Carrollton, 99.8.....	2-12-1959	<i>Oklahoma</i>		Waco, 99.97.....	9-25-1959
Gainesville, 95.6.....	9-19-1958	Lawton, 99.5.....	1-15-1959		
Macon, 99.85.....	11- 9-1959	Shawnee, 98.98.....	1-29-1960	<i>Virginia</i>	
Newnan, 99.....	11-20-1959			Charlottesville, 99.7.....	10-15-1959
Toccoa, 97.4.....	12-19-1958	<i>Oregon</i>		<i>Washington</i>	
Washington, 99.87.....	2-25-1959	Portland, 99.9.....	9-18-1959	Benton and Franklin Counties, 99.7.....	9-25-1958
<i>Kentucky</i>		<i>Texas</i>		Seattle-King County, 99.7 .....	5-12-1959
Madisonville and Hop- kins County, 99.....	12-11-1958	Abilene, 99.67.....	7- 2-1959		
Somerset and Pulaski County, 96.....	8-29-1958	Austin, 99.9.....	11-19-1959	<i>West Virginia</i>	
		Brenham, 95.5.....	7-11-1958	Kanawha County, 99.3..	8-29-1958
		Brownsville, 99.3.....	8-27-1959		
		Denton, 97.7.....	7-30-1959		

NOTE: In these communities the pasteurized market milk shows a 90 percent or more compliance with the grade A pasteurized milk requirements, and the raw market milk shows a 90 percent or more com-

pliance with the grade A raw milk requirements, of the milk ordinance recommended by the U.S. Public Health Service.

Notice particularly the percentage of the milk pasteurized in the vari-

ous communities listed. This percentage is an important factor in estimating the safety of a city's milk supply. All milk should be pasteurized, whether commercially or at home, before it is consumed.

# Federal Publications

**Highlights of Progress in Mental Health Research, 1959.** *PHS Publication No. 736; 1960; 51 pages; 25 cents.*

Significant developments in mental health research conducted and supported by the National Institute of Mental Health, Public Health Service, are described briefly.

The material, arranged under 14 classifications, reflects increased activity in the biological and sociological disciplines concerned with mental health, along with continued high interest in psychological studies.

Topics include pathology, biochemistry, psychopharmacology, metabolism, the brain, family relationships, child development, aging, alcoholism, the mental hospital, and community mental health services.

**Highlights of Research Progress in Allergy and Infectious Diseases, 1959.** *PHS Publication No. 745; 1960; 53 pages; 25 cents.*

Significant research accomplishments in 53 intramural and grant-supported projects of the National Institute of Allergy and Infectious Diseases, Public Health Service, are described briefly. Major subjects include allergy-immunology, cell biology, and bacterial, parasitic, fungus, and rickettsial diseases.

Areas of special interest include establishment of a program aimed at standardization of allergens, sponsorship of a symposium on encephalitis, and the first international congress on the relationship of pleuropneumonia-like organisms to human disease.

**Progress Against Cancer, 1959.** *PHS Publication No. 738; 1960; 61 pages; 25 cents.*

Fifty-five summaries of research findings by National Cancer Institute and grantee scientists present highlights in research progress and program developments during 1959. They are organized under 11 headings: virus studies, environmental carcinogens, tumors in laboratory animals, studies at the cellular level,

biochemical studies, cancer detection, radiation research, leukemia studies, chemotherapy research, and survival of cancer patients. Cancer courses and the laboratory demonstration conference for teachers are described in a section on special training.

The material was originally prepared for presentation at congressional hearings on appropriations. The opening statement by the director of the National Cancer Institute to the appropriations committees is included.

**Insecticidal Equipment for the Control of Insects of Public Health Importance.** *PHS Publication No. 774; 1960; by Harold G. Scott and Kent S. Littig; 33 pages; 25 cents.*

This training guide discusses equipment used in vector control, from hand dusters and compressed air sprayers to large power-driven fog and mist machines. Spray nozzles and their calibration with actual spray output are covered in one section.

The broad principles of operating the machines and the influence of atmospheric conditions are stressed. Fifteen line drawings, selected references, and a list of films augment the text.

**Tuberculosis. Laboratory methods in diagnosis.** *PHS Publication No. 770; 1960; 80 pages; 35 cents.*

Some of the more common laboratory methods used in the isolation and identification of tubercle bacilli and the unclassified (atypical) acid-fast bacilli are presented.

In addition to discussing general aspects of tuberculosis and safety measures to be observed in the laboratory, the manual gives detailed information on collection and shipment of specimens, laboratory methods of processing clinical materials, and cultural characteristics useful in identification of acid-fast bacilli. It also covers use of laboratory animals for typing of certain acid-fast

bacilli, cytochemical procedures used for virulence testing and typing mycobacteria, and methods of testing sensitivity of tubercle bacilli to therapeutic agents.

An extensive bibliography of material available through July 1959 is included.

**Highlights of Research Progress in General Medical Sciences, 1959.** *PHS Publication No. 739; 1960; 23 pages; 15 cents.*

Twenty-seven examples of research studies supported by the National Institutes of Health, Public Health Service, are reported in this pamphlet.

Included are findings in chemistry of life processes; genetics, cell biology, and human development; clinical research; and research in public and environmental health.

**Costs of Operating Nursing Homes and Related Facilities.** An annotated bibliography. *PHS Publication No. 754; 1960; by Maurice E. Odoroff, Anna MacRaney, and Anne B. Stageman; 38 pages; 20 cents.*

References to information on the costs of providing care in nursing homes, nonprofit homes for the aged, public facilities, and boarding homes are listed. A summary table highlights the general range in costs among facilities in these four categories. Additional references deal with accounting records for nursing homes and related facilities.

This bibliography should be useful to administrators of these facilities, State agencies responsible for planning, constructing, and licensing nursing homes, public assistance agencies, and persons concerned with the costs of providing care for the aged.

**Homemaker Services in the United States. Report of the 1959 National Conference on Homemaker Services.** *PHS Publication No. 746; 1960; 257 pages; \$1.25.*

Thirty-seven conclusions and recommendations provide the framework of this report.

An account of the development of homemaker services, description of present-day organizations and

services, and discussion of the need for expanding and adapting services under several types of auspices are included. The report also provides practical advice for organizing, administering, and financing home-maker services.

An annotated bibliography contains some 100 titles, most of them with publication dates since 1950.

**Federal Programs for Collection of Data on Water Use.** *Notes on Hydrologic Activities Bulletin No. 10; 1960; 43 pages; 35 cents.*

Federal agencies collecting data, collection schedules, scope and availability of data, and miscellaneous details are listed by category of water use. Categories include rural domestic, public water supplies, agriculture, manufacturing and mineral industries, hydro and thermo power, pollution abatement, recreation, fish and wildlife, and Federal installations.

This bulletin was produced as part of a program to determine the extent of data collection and the unmet needs for data. It was prepared under the auspices of the Inter-Agency Committee on Water Resources, Subcommittee on Hydrology.

**Insects That Carry Disease.** *PHS Publication No. 594 (Health Information Series No. 90); revised 1960; leaflet; 10 cents, \$5 per 100.* Describes habits and habitats of flies, cockroaches, mosquitoes, fleas, and ticks. Gives effective insecticides and repellents. Suggests sanitation practices for reducing infestations.

**Water Supply and Pollution Control. Research inventory, active projects, 1958.** *PHS Publication No. 768; 1960; 71 pages.*

Designed to facilitate exchange of information among research personnel, this inventory lists 280 projects by State. Site and title of each project as well as source and amount of financial support are given.

A subject index to the projects is included. Names and addresses of those who reported the data provide a source for more detailed information.

**Notable Contributions to Medical Research by Public Health Service Scientists. A bibliobibliography to 1940.** *PHS Publication No. 752; 1960; by Jeanette Barry; 96 pages; 60 cents.*

Brief bibliobibliographies present a selection of books and articles by and about medical and scientific officers of the Public Health Service, most of whom worked in the Hygienic Laboratory (later the National Institutes of Health) and in the Division of Scientific Research. They are collections of "landmarks" and are not intended to summarize the entire contribution of the Public Health Service to medical research during the period covered. The works included have been consistently cited in bibliographies as classic or original studies in their respective fields.

A chronological table lists the scientists and their fields of research.

**Public Health Service Film Catalog.** *PHS Publication No. 776; 1960; 66 pages; 50 cents.*

Some 320 motion pictures and filmstrips are listed by subject, with description, suggested audience, and information concerning availability for purchase. Titles are also given in alphabetical order and a subject index is included.

While the majority of these films are designed for training in the health professions, a number are intended for use with specific lay groups or with the general public.

All films included were produced by, for, or in cooperation with the Public Health Service, and they are available on loan from the film library of the Communicable Disease Center in Atlanta, Ga.

**Infectious Diseases in the Aging.** *PHS Publication No. 762; 1960; 238 pages; \$1.50.*

Designed to provide a reference source on diagnosis, care, and treatment of infectious diseases in older persons, this volume consists of reprints and abstracts of pertinent articles together with a list of selected readings.

The materials are grouped into a general category and under diseases

of five organ systems: respiratory, skin and special sensory organs, cardiovascular, gastrointestinal, and genitourinary.

Compilation of these materials was stimulated by the forthcoming White House Conference on Aging. The book is intended for use by public health agencies, medical care personnel, and others interested in the overall health needs of an aging population.

**Diphtheria.** *PHS Publication No. 60 (Health Information Series No. 37); revised 1960; leaflet; 5 cents, \$2.50 per 100.* Describes symptoms and methods of spreading diphtheria. Urges immunization of babies at 2 or 3 months of age and a "booster shot" about every 3 years. Recommends that persons previously immunized have "booster shot" at once if exposed to diphtheria.

**Typhoid Fever.** *PHS Publication No. 282 (Health Information Series No. 72); revised 1960; leaflet; 5 cents, \$2 per 100.* Describes symptoms and manner of spreading typhoid. Advocates good community and home health practices, including maintenance of safe water supply, proper sewage disposal, and pasteurization of milk. Recommends vaccination before vacationing or traveling in rural areas.

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This section carries announcements of new publications prepared by the Public Health Service and of selected publications prepared with Federal support.

Unless otherwise indicated, publications for which prices are quoted are for sale by the Superintendent of Documents, U.S. Government Printing Office, Washington 25, D.C. Orders should be accompanied by cash, check, or money order and should fully identify the publication. Public Health Service publications which do not carry price quotations, as well as single sample copies of those for which prices are shown, can be obtained without charge from the Public Inquiries Branch, Office of Information, Public Health Service, Washington 25, D.C.

The Public Health Service does not supply publications other than its own.

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## Mailing of Infectious Specimens for Diagnostic Purposes

U. PENTTI KOKKO, M.D., Dr.P.H., JOHANNES STUART, Ph.D., and GERALD TAYLOR, Ph.D.

FOR the past several years the U.S. Post Office Department, the Universal Postal Union, and the World Health Organization, as well as the Public Health Service, State health department laboratories, and other domestic health agencies, have been concerned with improving the procedures for rapid and safe transmission to diagnostic and research laboratories of material containing or suspected of containing pathogenic organisms.

Such organisms form only a small part of the diagnostic shipments. Most of the material received by laboratories is not even suspected of containing infectious agents. For example, in 1958 only 4 to 9 percent of the total specimens received by six State laboratories, for which information was at hand, were sent to be tested for the presence of a live infectious agent.

The Communicable Disease Center of the Public Health Service, the major Federal recipient and transmitter of infectious diagnostic specimens, has defined such specimens as follows:

1. All specimens of human or animal excreta, secretions, tissue or tissue fluids, or hair, which contain or are suspected of containing a live causative agent of a human disease or an animal disease transmissible to man, and which are shipped or mailed to a

diagnostic or research laboratory for isolation and identification of the etiological agent.

2. Pure cultures or concentrated isolates or vectors of etiological agents shipped from the isolating or collecting laboratory to a specialty laboratory for identification and typing, or further research, or both.

3. Pure cultures of known etiological agents which are used as reference cultures or as antigens in diagnostic laboratory procedures.

We have been unable to learn of any instance in which a person employed in transportation was infected with disease through handling of diagnostic specimens or other mail with which the specimens might have come in contact. It has been recognized that the hazards of shipping these specimens are relatively low and that their rapid and unobstructed movement is of vital importance in communicable disease control. There are no regulations in effect or contemplated which would hamper the free movement of this material. Yet this comparative freedom from regulation should not serve to encourage the neglect of adequate precaution in the shipment of diagnostic specimens.

Because the Laboratory Branch, Communicable Disease Center, annually processes and mails out large numbers of infectious specimens, a series of experiments were conducted to develop a shipping procedure which would be safe, simple, and inexpensive and which would comply with the principles of the Public Health Service regulations governing the shipment of etiological agents (1) and also with the conditions set by the Convention of the Universal Postal Union (see excerpt p. 983). As a result of these experiments, a safe and practical packaging procedure has been adopted

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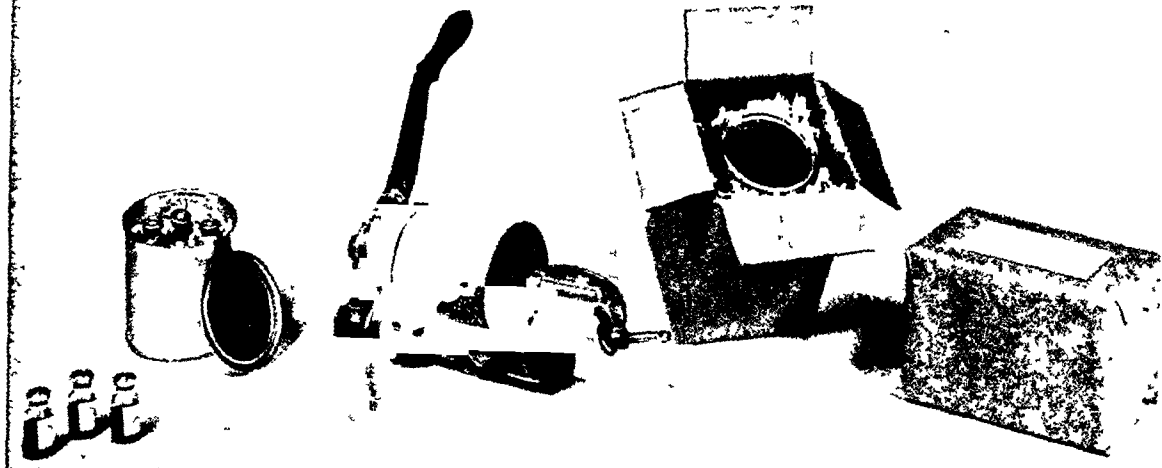


Figure 1. Steps in assembling package

for all shipments of infectious diagnostic material from the Laboratory Branch. This procedure has been tested by actual use for more than a year and has already been introduced to State laboratory directors.

In brief, the packaging procedure is as follows. The specimen is enclosed in a bottle or tube of thick glass which is sealed with a rubber or paraffin-treated cork. Enclosure by fusion, of course, is also acceptable. Screwcaps are not recommended because leakage frequently occurs, particularly when outside pressure decreases during air transportation. The cork is secured with a metal collar or with a good grade of adhesive tape. The glass container is then placed in an airtight and watertight tin can with vermiculite, sawdust, or other suitable material for insulation. The can is packed in a cardboard container with shock-resisting insulating material and wrapped for shipping (fig. 1).

Glass bottles are preferred to test tubes because of their greater shock resistance and are used by the Laboratory Branch whenever practical. However, heavy-walled test tubes are entirely acceptable provided there is sufficient space in the can for shock-absorbing material to be packed all around the tube. If several tubes are packed in the same can, it is important that they be wrapped individually in soft paper or cloth to provide adequate insulation between the tubes.

The bottles presently being used at the Labo-

ratory Branch are regular hard glass serum bottles in sizes from 2 ml. up. The bottles are sealed with a rubber stopper secured in place with an aluminum collar. Prices of the bottles, depending on size, quantity, and type of stopper, begin at 2 cents per setup.

The tin cans in use are regular No. 3 household cans sealed by roll crimping the lid with a home canning device. The cans are priced at approximately 12 cents each when purchased in quantities of 100. The price of a satisfactory canning device is less than \$15. Pressure-sealed paint cans in quantities of 100 are priced approximately as follows: pint, 11 cents each; quart, 13 cents; half gallon, 23 cents; gallon, 29 cents. For an occasional shipper, such as a research institute or hospital, they offer the advantage of not requiring a crimping device. The larger sizes are practical for occasional large-quantity shipments and may be used as the outer containers required by the international postal regulations.

In our experiments, the No. 3 crimped-sealed cans proved to be remarkably resistant to various outside forces. They withstood slow vertical pressure of 3,000 pounds per can very well. "Rapid" pressure of 3,000 pounds slightly indented the cans but did not break the bottles inside. They resisted horizontal pressures up to 800 pounds per can without losing their shape. When the pressure was increased to 1,200 pounds, the cans were compressed to a boxlike shape, still without break-

ing the bottles inside (fig. 2). Sharp shocks produced by dropping unwrapped cans onto concrete several times from a height of 20 feet caused only slight denting of edges (fig. 3).

Since a considerable percentage of diagnostic specimens are sent by airmail, a number of airdrops were also performed. This was made possible through the assistance of the Naval Air Station, Marietta, Ga. (then of Chamblee, Ga.). Surprisingly little damage was caused by dropping packages and unwrapped cans from an airplane flying at an altitude of 1,000 to 1,500 feet (fig. 4).

The only breakage of the contents of the cans in the airdrops occurred in a can which contained 16 regular 15- by 150-mm. test tubes, the only insulating material being a thin layer of paper between the tubes. In this can, 1 tube of the 16 broke; the others remained intact. All other glass containers, including several milk-dilution bottles which were packaged with a sufficient amount of shock absorber, were unbroken and unopened. Seventeen packages were dropped in this experiment.

Rapid decompression experiments were conducted through the cooperation of the U.S. Naval School of Aviation Medicine, Pensacola, Fla. In these tests, explosive decompression to 1.69 pounds per square inch in 0.1 second, corresponding to the maximum stress likely to be encountered if the cabin of an airplane should suddenly decompress at an altitude of 50,000 feet, caused only slight bulging on the ends of the cans. The leakage from the bottles in the cans was checked by using varying amounts of colored alcohol in the bottles and white absorbent cotton around the neck of the bottles (fig. 5). No leakage occurred.

Actively metabolizing *saccharomyces* cultures did not cause any observable bulging of the sealed cans during a sustained incubation period at 37° C.

Our experience with the paint cans has been essentially the same as with No. 3 household cans. None of the paint cans came open despite rough handling (fig. 4). However, our experiments with paint cans have been limited to products of one manufacturer. Therefore, we are recommending that until additional experience is gained, the lid of larger size paint cans be spot soldered before wrapping. It can be

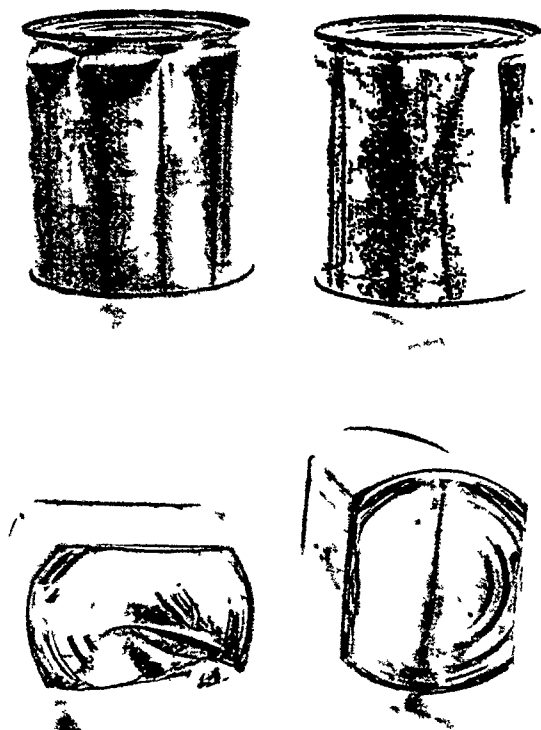


Figure 2. Above, cans subjected to 3,000 pounds vertical pressure; below, cans subjected to 1,200 pounds horizontal pressure



Figure 3. Unwrapped can dropped 10 times onto concrete from height of 20 feet

done easily by using low-melting wire solder. Three or four spots are believed to be sufficient.

The staff of the Communicable Disease Center, on the basis of the tests cited, is convinced of the safety in shipment of infectious or potentially infectious diagnostic specimens packaged in the manner described and commends these procedures to laboratories and others concerned.

The Laboratory Branch was informed recently that the Post Office Department, with more than 36,000 post offices, cannot possibly insure that packaging requirements will be complied with. Therefore, the Department does not rely on regulations and their enforcement for compliance but on a criminal statute which places the liability on shippers for proper packaging.

The criminal statute concerned (18 U.S.C. 1716) is of material interest to all shippers of diagnostic specimens whether potentially pathogenic or not. In fact, most intransit damage to laboratory specimens involves blood specimens for serology and urine specimens for chemical testing rather than testing for pathogenic organisms. If spillage occurs so as to injure or damage mail, equipment, or personnel, the shipper may face prosecution even though there is no question of hazard from an infectious agent. The value of careful packaging with a sufficient amount of absorbing material around the glass to soak up any leaking fluid, therefore, extends well beyond the major concern of this report, the prevention of infection.

Regarding the international transport by mail of perishable biological material which may contain living pathogenic micro-organisms and viruses, the most recent Convention of the Universal Postal Union contains two main points:

- Letter mail containing perishable biological materials shall be packed according to the precise description given and identified by a label adopted for the purpose. (The label is illustrated on the frontispiece.)

- Such letters shall be exchanged only between "officially recognized laboratories."

More complete information on the provisions of this convention and packaging requirements

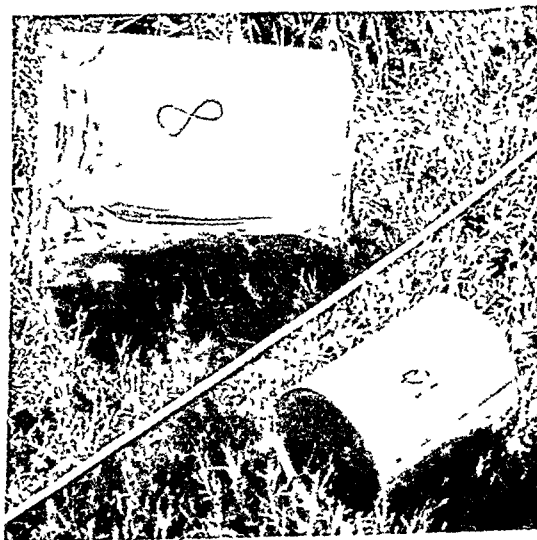


Figure 4. Packages and cans dropped on hard sun-baked ground from a plane at 1,000 to 1,500 feet altitude. Above, package with least damage; center, package with most damage; below, unwrapped cans

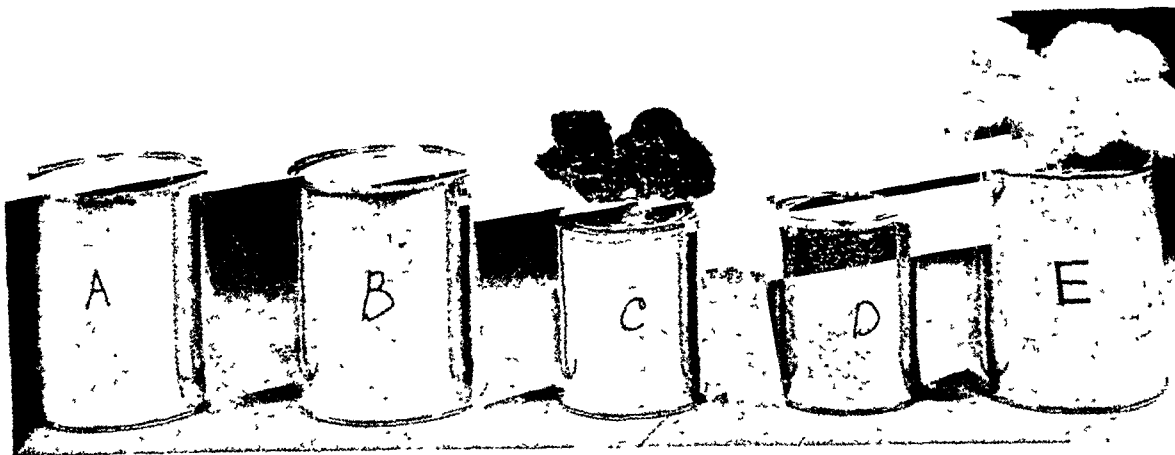


Figure 5. Cans subjected to explosive decompression to 1.69 pounds per square inch in 0.1 second. A and B are household cans, C, D, and E, paint cans. Bottles on top of C and E were removed from cans after the experiments. Colored alcohol was put inside the bottles and cotton around the necks to check for leakage

for international mailing are given in the excerpt from the Postal Manual below.

In order to avoid misunderstanding, it should be pointed out that the requirement of the Convention of the Universal Postal Union to use violet-colored labels on packages carried in international letter mail is in addition to and not in lieu of any Federal quarantine regulations (2,3) which require an import permit for etiologiical agents and vectors. For human pathogens, request for an import permit should be made in advance to the Surgeon General, Public Health Service, Attention, Division of Foreign Quarantine, Washington 25, D.C., and for animal pathogens, to the Inspection and Quarantine Division, Agricultural Research Service, Department of Agriculture, Washington 25, D.C. Shipments arriving without permits are subject to delay which may destroy the viability of the specimens. An advance permit from the Department of Agriculture is also required when shipping imported animal pathogens and vectors between laboratories in the United States.

#### EXCERPT FROM POSTAL MANUAL

##### 221.325 *Perishable Biological Materials*

###### a. Mailing Restriction

Perishable biological materials, including those of pathogenic nature, when sent in the postal union mail may be sent only as letter packages packed as prescribed in 221.325c, and may be sent only to the countries that have agreed to accept them. The packages must bear distinctive violet labels by which they can

readily be recognized and receive careful handling and prompt delivery. The countries that have agreed to accept letter packages containing perishable biological materials are:

Aden	Malta
Argentina	Mauritius
Australia	Netherlands Antilles
Austria	New Zealand
Barbados	Nigeria
Belgian Congo	North Borneo
Belgium	Norway
Bermuda	Persian Gulf ports
Cayman Islands	Philippines
Cyprus	Poland
Czechoslovakia	Portugal
Denmark	Rhodesia and Nyasaland
Falkland Islands	Saint Helena
Fiji Islands	Salvador (El)
Germany (Eastern)	Sarawak
Ghana	Sierra Leone
Gibraltar	Somaliland Protectorate
Gilbert and Ellice Islands	Spain
Great Britain and Northern Ireland	Sudan
Hong Kong	Sweden
Hungary	Switzerland
Iceland	Tanganyika
India	Trinidad
Israel (infectious substances not permitted)	Turkey
Jamaica	Turks Islands
Japan	Union of South Africa, except Basutoland and Swaziland (added February 25, 1960)
Kenya and Uganda	Uruguay
Lebanon	Zanzibar
Malaya	

###### b. Qualification of Mailers

(1) Only officially recognized laboratories may send or receive letter packages containing perishable

biological materials. Laboratories of the following categories are so designated:

Laboratories of local, State, and Federal Government agencies.

Laboratories of federally licensed manufacturers of biological substances derived from bacteria and viruses.

Laboratories affiliated with or operated by hospitals, universities, research facilities, and other teaching institutions.

Private laboratories licensed, certified, recognized, or approved by a public authority.

(2) A laboratory desiring to mail letter packages containing materials of this kind shall make written application on its letterhead stationery to the International Service Division, Bureau of Transportation, Post Office Department, Washington 25, D.C., explaining its qualifications and those of the prospective addressee to send and receive such materials, and stating how many packages are to be mailed. On approval, the mailer will receive a sufficient number of the violet labels for the contemplated shipments.

#### c. Packaging

(1) Perishable biological material not of a pathogenic nature must be packed in a nonporous container surrounded by sufficient absorbent material to take up all the liquid and must be placed in an outer protective container where it should fit tightly to avoid any shifting.

(2) Perishable biological material of a pathogenic nature must be packed in a tightly closed bottle or tube of heavy glass wrapped in thick, absorbent material rolled several times around the bottle or tube and tied at the ends, sufficient in quantity to absorb all the liquid; the wrapped container must be placed in a strong, well-closed metal box so constructed as to prevent any contamination outside of it. This metal box must be wrapped in cushioning material and placed in an outer protective box where it should fit tightly so as to avoid shifting. The outer container must consist of a hollow block of strong wood, metal, or other equally strong material with a tight lid so fitted that it cannot open during transportation.

(3) In addition to the requirements in (1) and (2), packages must comply with the regulations governing the transmission of such materials in the domestic mail.

(4) The mailer must place on each package one of the violet labels mentioned in a and b(2).

#### REFERENCES

- (1) U.S. Public Health Service: Regulations. Shipment of certain things. 42 CFR 72.25 (1960).
- (2) U.S. Public Health Service: Regulations. Importation of certain things. 42 CFR 71.156 (1960).
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## Anti-Pollution Study in Great Lakes Basin Waterway

A 6-year anti-pollution study of the U.S. portion of the Great Lakes Basin-Illinois Waterway was launched by the Public Health Service in September 1960.

The study, which was authorized by the 86th Congress with \$500,000 for the first year, is designed to aid the development of a comprehensive plan to control and prevent pollution in the area.

Under the jurisdiction of the Service's Division of Water Supply and Pollution Control, immediate efforts are directed to:

- An inventory of all points of inflow into the Chicago River, Sanitary and Ship Canal, the Calumet-Sag Canal, and their tributaries.

- Measurement and analysis of municipal and industrial wastes being discharged at such points of inflow.

- Effect of such discharges on water quality of the Illinois Waterway under present rate of flow.

- Methods of improving the water quality of the Illinois Waterway.

- Determination of the water quality of the Illinois Waterway under present and various decreased rates of flow.

Project headquarters are in Chicago, under the direction of William Q. Kehr, Public Health Service engineer. The overall project, with a staff of 40 scientists and technicians, is coordinated by H. W. Poston, water program director of the Service's regional office in Chicago.

A special master of the Supreme Court has been conducting hearings in cases which concern the use of Lake Michigan water and to which the States of Wisconsin, Michigan, Illinois, Minnesota, New York, Pennsylvania, and Ohio and the United States are parties. The study has been planned so that data gathered in the first phases will assist the Court in making its decisions.

# New and Improved Antigen Suspension for Rapid Reagin Tests for Syphilis

JOSEPH PORTNOY, Ph.D., and WARFIELD GARSON, M.D., M.P.H.

THE RAPID REAGIN tests for syphilis using unheated plasma or serum (1-3) make use of an antigen suspension prepared by resuspending centrifuged VDRL slide antigen suspension in choline chloride. In an early publication (1) it was noted that the antigen suspension was stable for a period of at least 1 week. Subsequent observations indicated that some antigen suspensions retained their reactivity for as long as 18 months. However, it was evident that there was no uniformity to this stability; and, indeed, it was found that the antigen suspension might become subreactive even after 1 day of storage. This erratic behavior, although not vitiating the usefulness of the rapid reagin tests, constituted a disadvantage.

It was soon realized that the ultimate solution to the development of a more uniformly stable antigen suspension would depend upon the elucidation of the mechanism by which suspensions of antigen underwent altered reactivity. The investigations to be reported indicated that loss in antigen reactivity was mediated by an oxidative process which is catalyzed by cations. By use of a chelating agent to bind these cations a uniformly stable antigen suspension was obtained.

## Materials and Methods

The RPR test was conducted according to the Manual of Serologic Tests for Syphilis (4).

Variations from standard procedures for preparing antigen suspension will be noted under particular experiments.

Stock solutions of cations were prepared

from reagent grade chemical dissolved in distilled water to a concentration of  $10^{-2}$  M. These were further subdiluted in water as indicated.

Antigen suspensions were stored in screw-capped test tubes at indicated temperatures and were brought to room temperature before testing. The stability of antigen suspensions was determined by use of serial twofold dilutions of pooled reactive human serum in saline.

## Effect of Cations and Peroxide

RPR antigen suspensions were prepared to contain  $10^{-5}$  M concentrations of the cations indicated and 0.5 percent hydrogen peroxide. This was accomplished by preparing a concentrated RPR suspension which was then dispensed in suitable aliquots and adding the required cations and peroxide. Following the addition of these reagents the antigen suspensions contained the usual concentrations of choline chloride (10 percent), sodium chloride (0.85 percent), and merthiolate (0.01 percent).

The capacity of the various cations to flocculate antigen suspension, independent of reagin, was determined on the day the antigens were originally prepared, by testing the indicated solutions against regular RPR antigen. Table 1

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shows that  $\text{Cu}^{++}$ ,  $\text{Fe}^{++}$ ,  $\text{Fe}^{+++}$ , and  $\text{Zn}^{++}$  produced clumping at a dilution of  $10^{-3}$  M, whereas  $\text{Ag}^{+}$  caused clumping at a concentration of  $10^{-4}$  M. The other cations did not flocculate the antigen at  $10^{-3}$  M or lower concentrations. It was further determined that on the day they were prepared the antigens incorporating cations alone or in combination with peroxide gave results with test serums equal to that of a control antigen.

On storage at room temperature,  $\text{Cu}^{++}$  produced a loss in reactivity in 1 week;  $\text{Fe}^{+++}$ ,  $\text{Ca}^{++}$ , and  $\text{Zn}^{++}$  caused a loss in reactivity in 2 weeks; the other cations showed no effect greater than the control antigen (table 1). In the presence of peroxide a shortening of the reactivity loss period was noted with  $\text{Mg}^{++}$  and  $\text{Co}^{++}$ .

#### Effect of EDTA on RPR Antigen Suspensions

Because of the pronounced activity of  $\text{Cu}^{++}$ , experiments were designed to determine the effect of varying concentrations of this cation alone or in combination with peroxide. The ability of ethylene dinitrilo tetra-acetic acid, disodium salt (EDTA) to overcome the deteriorative effects of copper and peroxide was determined. The experimental design was similar to that reported above for study of the different cations. EDTA was prepared as a

Table 1. Effect of various cations and peroxide on the stability of RPR antigen

Salt used	Cation valence	Stability in presence of—		Flocculating action
		Cation alone <sup>1</sup>	Cation and peroxide <sup>1</sup>	
Cupric sulfate-----	2	1	1	$10^{-3}$ M.
Ferrous chloride-----	2	3	2	$10^{-3}$ M.
Ferric chloride-----	3	2	2	$10^{-3}$ M.
Magnesium sulfate-----	2	3	1	Negative.
Manganese chloride-----	2	3	2	Do.
Nickel chloride-----	2	3	2	Do.
Cadmium chloride-----	2	2	2	Do.
Cobalt chloride-----	2	3	1	Do.
Zinc acetate-----	2	2	2	$10^{-3}$ M.
Mercuric chloride-----	2	3	2	Negative.
Silver nitrate-----	1	3	2	$10^{-3}$ M.
Controls:				
No cation, no peroxide-----		3	-----	-----
Peroxide alone-----		2	-----	-----

<sup>1</sup> Number of weeks at which time reactivity less than standard was observed.

stock 0.2 M solution in water, adjusted to pH 7.0 (potentiometric) with NaOH and incorporated into the antigen suspensions. Storage was at room temperature.

The deteriorative influence of  $\text{Cu}^{++}$  alone and the accelerated change produced by both the cation and peroxide can be observed in table 2.

Table 2. Effect of peroxide, copper ions, and EDTA on the stability of RPR antigen

Antigen	Peroxide	Concentration copper (molar)	Concentration EDTA (molar)	Days storage at room temperature				
				1	7	14	22	31
1-----	(+)	$10^{-4}$	0	L	L	M	M	M
2-----	(+)	$10^{-5}$	0	S	L	L	M	M
3-----	(+)	$10^{-6}$	0	S	L	L	L	L
4-----	(+)	0	0	S	S	L	L	L
5-----	0	$10^{-4}$	0	S	S	S	L	L
6-----	0	$10^{-5}$	0	S	L	L	L	L
7-----	0	$10^{-6}$	0	S	S	L	L	L
8-----	0	0	0	S	S	S	L	L
9-----	(+)	$10^{-4}$	$1.25 \times 10^{-2}$	S	S	S	S	L
10-----	(+)	$10^{-4}$	$1.25 \times 10^{-4}$	S	S	S	S	L
11-----	(+)	$10^{-4}$	$1.25 \times 10^{-6}$	S	L	M	M	M
12-----	(+)	$10^{-5}$	$1.25 \times 10^{-2}$	S	S	S	S	L
13-----	(+)	$10^{-5}$	$1.25 \times 10^{-4}$	S	S	S	S	L
14-----	(+)	$10^{-5}$	$1.25 \times 10^{-6}$	S	L	L	L	L

S—Reactivity equal to standard.

M—Reactivity greater than standard.

L—Reactivity less than standard.

+—Present in concentration of 0.5 percent.

0—Absent.

EDTA in a concentration as low as  $1.25 \times 10^{-4}$  M inhibited these deteriorative changes for 3 weeks.

### Old and Improved RPR Suspensions

The sediments from a common pool of VDRL slide antigen emulsion were resuspended in the usual way to yield the "old" or regular RPR suspension and in the following solution to produce the "improved" RPR suspension:

	Milliliters
0.1 M EDTA in distilled water.....	2.5
40 percent choline chloride in distilled water....	5.0
0.02 M phosphate buffer, 0.2 percent merthio- late <sup>1</sup> .....	10.0
Distilled water.....	2.5

<sup>1</sup>Na<sub>2</sub>HPO<sub>4</sub>, 1.42 gm., KH<sub>2</sub>PO<sub>4</sub>, 1.36 gm., merthiolate 1.00 gm., distilled water to 500 ml., pH of solution 6.9.

The volume of the resuspending solution was in each instance equal to the volume of the antigen emulsion centrifuged.

Duplicate preparations of antigen suspensions were stored at refrigerator, room, and incubator (35° C.) temperatures. Table 3 indicates the superiority of the improved suspension. Whereas the old type varied in stability from 1 to 17 weeks, the improved suspension, particularly when stored in the refrigerator, was good for at least 8 months. Lesser stability was observed at room and incubator storage conditions.

Table 4 presents the results of comparative tests with unheated plasma and unheated serum samples. The improved suspension was only slightly less reactive than the old type.

### Discussion

The possible role of cations in producing unstable characteristics in lipid antigens was suggested by the work of Ray, Davisson, and Crespi (5) who studied the degradative changes of the lipoproteins of rabbit and human serums undergoing dialysis. When all traces of cupric ions were removed the lipoprotein was stable on dialysis. Numerous other metal ions were without effect. Changes similar to those occurring during dialysis could be experimentally produced by the addition of hydrogen peroxide

and a trace of Cu<sup>++</sup>. The presence of a chelating agent inhibited the reaction. Ray and co-workers suggested that the degradation was oxidative in nature and catalyzed by copper.

The observations made in the present study suggest that a similar mechanism underlies the loss in reactivity of lipid antigen suspensions. Of the cations studied, copper was most active in producing degradation even in the absence of added peroxide. Magnesium and cobalt were quite active in the presence of added peroxide. EDTA reversed the deteriorative changes produced by copper and peroxide. The subsequent incorporation of EDTA into RPR suspension produced uniform stability particularly when suspensions were stored in the refrigerator. The omission of sodium chloride from the improved suspension was prompted by the observation that a finer dispersion of particles was obtained with nonreactive specimens. The reactivity of the improved sus-

**Table 3. Comparison of stability of old and new types of RPR antigen**

Type of antigen	Number of lots	Expiration period (weeks) when stored in—		
		Refrigerator	Room	Incubator
Old.....	16	1-17.....	1-11	2-10.
New.....	16	Indefinitely.	8-25	22 or more.

**Table 4. Comparison of reactivity of regular and improved RPR antigen suspension**

Type of sample	Results with regular antigen	Number	Results with improved antigen		
			Reactive	Weakly reactive	Nonreactive
Plasma...	Reactive.....	35	35	-----	-----
	Weakly re-active.	2	1	1	-----
	Nonreactive....	43	-----	-----	43
Serum....	Reactive.....	50	47	3	-----
	Weakly re-active.	6	-----	3	3
	Nonreactive..	81	-----	-----	81



pension was found to be essentially similar to regular RPR suspension.

Samples of the improved suspension exposed to a wide variation of temperature over a 10-day period have maintained a uniform stability. These samples varied in age from 1 to 7 months at the time they were exposed. Preliminary studies have likewise suggested that the principle of preservation by the addition of EDTA may be of value for other lipid antigen emulsions used in the serology of syphilis, but further experience is needed before a specific recommendation can be made for its broader use.

### Summary and Conclusions

The loss of reactivity of stored antigen suspensions used in reagin tests for syphilis is mediated in part by an oxidative process and catalyzed by cations.

More uniformly stable antigen suspensions were obtained by the incorporation of a chelat-

ing agent ethylene dinitrilo tetra-acetic acid, disodium salt (EDTA) in antigen suspension used in the rapid reagin tests.

The use of this agent in the suspensions used for the rapid reagin tests is recommended.

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## Unexploited Breakthroughs in Cancer Research

Although the ultimate research goals in cancer are still in the future, Dr. Michael B. Shimkin of the National Cancer Institute, Public Health Service, directs attention to the following discoveries that, if fully applied, would have a major impact upon the occurrence, mortality, and tragedy of cancer.

*In the prevention of cancer*, the elimination of the cigarette habit would reduce the incidence of lung cancer by 60 percent, a saving of some 20,000 deaths from lung cancer per year. Additional reduction in the lung cancer incidence could be achieved by controlling major sources of air pollution, such as fumes from automobile exhausts. (Burney, L. E.: *J.A.M.A.* 171: 1829-1837, Nov. 28, 1959. Shimkin, M. B.: *In Tumors of the Chest*, edited by D. Spain, New York, Grune and Stratton, 1960, pp. 1-16.)

*In the diagnosis of cancer*, the application of cervical cytology to the total female population remains unrealized. Self-obtained smears, central laboratories to which smears could be mailed, and intensi-

fied research in methods of cytoanalysis need to be applied to solve the logistics of this problem. The full use of this discovery should reveal 10,000 cases of cervical cancer and precancer per year, at a stage when the disease is curable in almost 100 percent of the cases. (Brunschwig, A.: *Cancer* 7: 1182-1184, 1954. Dunn, J. E., et al.: *J. Nat. Cancer Inst.* 23: 507-528, 1959.)

*In the treatment of cancer*, modern therapeutic trials must be undertaken to test the traditional concepts of operability. There is no convincing evidence that radical mastectomy yields better results than the simple mastectomy for breast cancer, and a comparison of the operations is overdue by a decade. If no significant difference can be demonstrated, 20,000 women each year would be managed more conservatively and gently. (Shimkin, M. B., et al.: *Surg. Gynec. & Obst.* 94: 645-661, 1952. Smith, S. S., and Meyer, A. C.: *Am. J. Surg.* 98: 653-656, 1959.)

A CURRENT LOOK

# VENEREAL DISEASES

The fight on venereal disease has reached a turning point, according to authorities attending a series of seminars on venereal disease conducted by the Public Health Service in major urban areas during the spring of 1960.

The knowledge and skills are available, they conclude, to reduce syphilis and gonorrhea to the point where public defenses need be only nominal, if strong measures are applied within the next few years. Unless such action is taken promptly, however, they believe the recent increase of venereal disease may become seeded throughout the population. And this increase may be speeded as the microbial agents grow to resist present forms of medication. The public is threatened also by the tendency of each infected patient to expose four others, on the average, and by a modern moral and technological climate which tends to sanction if not encourage such promiscuity.

Granting that a change in the pattern of sexual activity is less likely to occur than a change in public health practice, it was con-

cluded that, until immunization methods are discovered, the best hope of controlling venereal disease is to apply Dr. Thomas Parran's classic formula of diligent and systematic methods of finding persons with infectious syphilis and bringing them to treatment before they expose four others.

For the time being at least, venereal disease can be cured promptly by medical treatment, using simple, painless methods. But except for the development of attitudes which discourage promiscuous sexual habits, the only way to prevent venereal infection today is to find and treat carriers of the germs.

Expedited casefinding using all available community resources is essential to effective control. Much depends on the voluntary appearance of patients for treatment and their willingness to name associates and contacts.

For all the time that goes into locating potential patients, and interviewing, testing, and treating them, casefinding is a small price to pay for preventing the infection from going

to extremes. Major economies in finding cases could be achieved if physicians reported all presumably infected patients to health departments; if courts required tests of all persons arrested; and if hospitals and laboratories routinely reported positive findings in the more than 13 million blood tests performed annually.

Recommendations of the conference in Chicago in April 1960 emphasized the following points:

- With more than 13 million serologic tests processed annually in the United States, reports from all private and public laboratories would help health agencies to check with physicians to assure adequate treatment of all patients and epidemiological investigation of all infectious cases.

- If every patient with infectious syphilis were treated as an emergency and interviewed promptly, contacts, suspects, and associates could be pursued with the greatest possible rapidity. In this procedure, the telephone would be the primary reporting tool followed immediately by an epidemiological report.

- The telephone should be used especially to initiate and expedite investigations of contacts or suspects who are outside the jurisdiction of the primary investigator.

- Hospitals which do not perform routine blood tests upon admission could be encouraged to do so, perhaps by supplying them with tubes, needles, and other necessary equipment at public expense, as necessary for this purpose.

- In the attack on venereal disease, all community resources and all professional skills available are needed and should be used.

- There is a need for serologic screening of ships' crews, arranged by international action, with financial support available to port areas to deal with the threat of infection among the host of mobile and transient visitors. Opening of the St. Lawrence Seaway specifically suggests the opportunity for visitors to seed new chains of infections at inland ports, in the absence of hygiene or sophistication.

- A plea for more effective cooperation by private physicians suggested that physicians order serologic tests for syphilis whenever indicated, give alert attention to early infectious lesions, report all cases diagnosed and treated, report promptly and interview patients with

a positive STS recorded on their hospital charts, and refrain from unnecessary treatment of patients with a positive STS and a history of previous STS or treatment. It was observed that although State health departments differ in recommendations for treatment, "none advises total dosages as great as 10 million units of penicillin for asymptomatic syphilis or repeated treatments because of persistent positive STS in patients treated for late syphilis."

It was proposed that medical schools in at least a few hours of didactic instruction provide reasonably uniform information about the importance of histories in syphilis, the interpretation of serologic tests, and general principles of treatment.

A popular view, if not a consensus, was that eradication of syphilis in the United States is a practical goal; that efforts should be concentrated on casefinding for control of infectious syphilis; that participation by private physicians is essential to effective control; that special studies should be directed toward the epidemiology of venereal disease among young people; that informational and educational efforts should be intensified; and that research and demonstration should be encouraged to assist diagnosis of gonorrhea in the female.

## Current Status of Syphilis In the United States

WILLIAM J. BROWN, M.D.

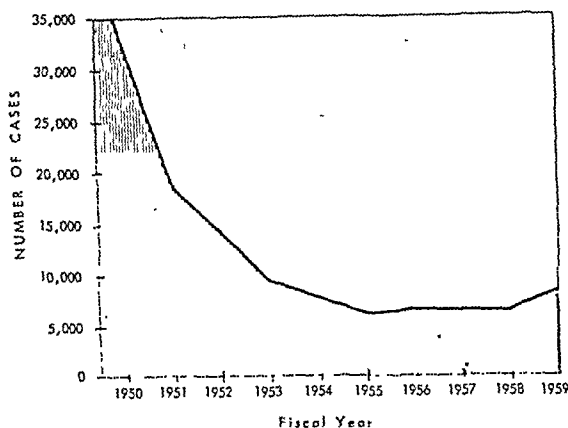
*Chief, Venereal Disease Branch,  
Communicable Disease Center,  
Public Health Service*

Syphilis remains a public health problem of major and increasing proportions.

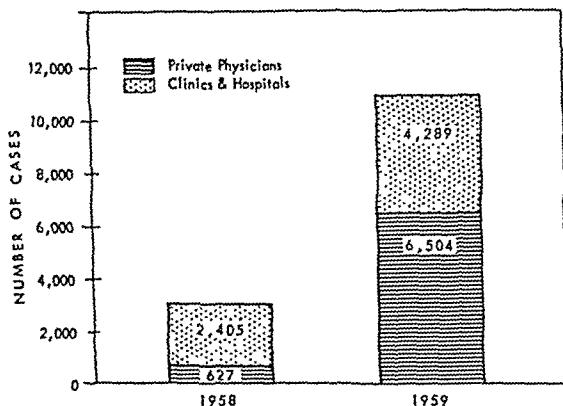
A total of 120,000 cases were reported among civilians alone in 1959, of which 8,200 were in the early infectious stages (fig. 1).

Reported cases of infectious syphilis have been increasing alarmingly since 1957. Moreover, there is no indication that the trend is changing. Almost 42 percent more infectious syphilis was reported from July to December of 1959 than was reported during the same 6 months of the previous year. We estimate the

**Figure 1. Primary and secondary syphilis cases reported in the United States, 1950-59**



**Figure 2. Primary and secondary syphilis cases reported by private physicians and clinics and hospitals, Pennsylvania, 1958-59**



reservoir of untreated syphilitics today at 1,200,000 cases and that the true annual incidence is 60,000 cases.

Already the cost of 33,000 paretics in tax-supported mental institutions is \$48 million a year. And if we do not find and treat the 1¼ million untreated, we may expect an additional 178,000 to develop late disabling manifestations. This will include 52,800 more cases of paresis and meningovascular syphilis requiring about 530,000 years of hospitalization at a cost of almost a billion dollars. It will also include 23,000 cases of tabes, 6,000 of optic atrophy, and 91,000 of cardiovascular syphilis.

Clearly, at this point syphilis is not under control. This is not to say that we have not made progress against syphilis in this coun-

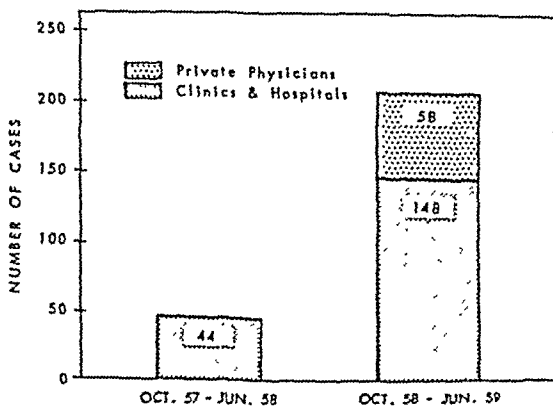
try, because we have. For example, deaths from syphilis have dropped from 14,000 to 4,000 a year, and infant deaths due to syphilis have dropped from 574 to fewer than 1 per 100,000 live births.

Fortunately, syphilis, for several reasons, is not spreading in geometrical progression, but it does seem to be spreading faster than we can find and treat it. A variety of factors, such as environment, economics, and social structure, may influence the spread of syphilis in a population. Some syphilitics, for example, do not have opportunity for further intercourse while they are infected. Moreover, syphilis is not contracted at every exposure to infection. And also, some chains of infection and chains of contact double back on themselves in large part and are contained within certain social groups.

Venereal disease control always has depended upon research to develop techniques of diagnosis and treatment, and upon a vigorous case-finding program to find infected persons and bring them to treatment faster than infection could spread. I believe that the late Dr. Joseph Earl Moore, in paraphrasing Frost on tuberculosis, was correct when he said, "... it is not necessary that transmission be immediately and completely prevented. If, in successive periods of time, the number of infectious hosts is continuously reduced, the end result ... if continued long enough, must be the extermination of the treponeme of syphilis."

Today, techniques of both diagnosis and

**Figure 3. Primary and secondary syphilis cases reported by private physicians and clinics and hospitals in Louisiana during two corresponding 9-month periods, 1958-59**



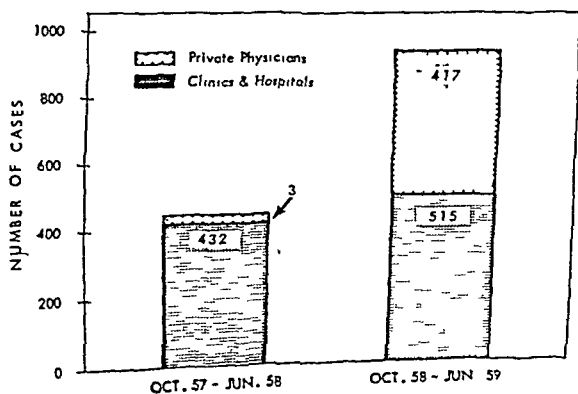
treatment have been developed almost to the ultimate. Epidemiology, however, has lagged behind, particularly among patients of private physicians. Consequently, a large part of our national program is now being oriented to the development of working relationships between public health and the private practitioner.

We have had some measure of success in persuading private physicians to report their cases and to have them interviewed by a trained epidemiologist. The Pennsylvania program is a good example. Reporting by private physicians in Pennsylvania increased more than 10 times from 1958 through 1959 (fig. 2).

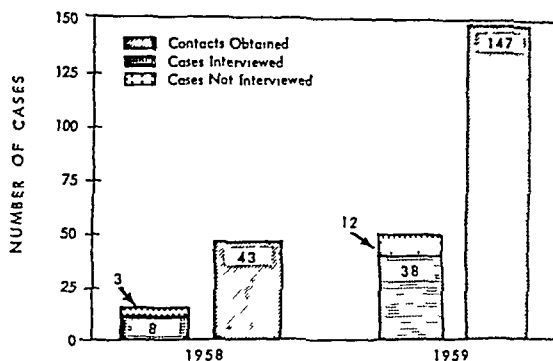
In 1958, the Louisiana State Health Department began to stimulate reporting among private physicians through personal visits, talks at medical society meetings, and followup of reactive serologies from public and private laboratories and hospitals. The results are shown in figure 3. In two corresponding 9-month periods, cases of primary and secondary syphilis reported by private physicians rose from 0 to 58. During the same two periods, early latent cases reported by private physicians increased from 3 to 417 (fig. 4).

Kansas is another typical example of improved interviewing among primary and secondary syphilis patients of private physicians. Morbidity reporting of early lesion syphilis treated by private physicians in Kansas rose from 11 cases in 1958 to 50 cases in 1959 (fig. 5). Further, the number of privately treated pa-

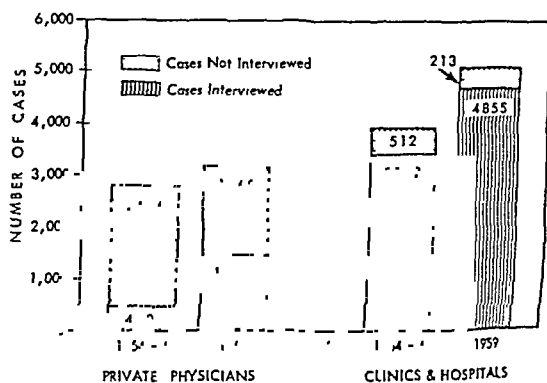
**Figure 4. Early latent cases of syphilis reported by private physicians and clinics and hospitals in Louisiana during two corresponding 9-month periods, 1958-59**



**Figure 5. Results of contact interviewing of primary and secondary syphilis patients treated by private physicians, Kansas, 1958 and 1959**



**Figure 6. Contact interviewing of primary and secondary syphilis patients treated by private physicians and in clinics and hospitals, United States, yearly average, 1954-58, and 1959**



tients with primary and secondary syphilis who were interviewed during the same period increased from 8 to 38. As a result, contacts of private physicians' patients who were interviewed increased from 43, in which there were no cases of infectious syphilis, to 147, which included 14 with primary and secondary syphilis.

Overall improvement has been made in interviewing privately treated primary and secondary syphilis patients across the country as shown in figure 6. In the 5-year period ending in 1958, an average of 17 percent of these patients were interviewed per year by a trained interviewer. During 1959, this percentage was still increasing. Forty-nine percent of all patients with infectious syphilis reported by private physicians were interviewed for sex contacts by a trained interviewer.

From the standpoint of epidemiology, success with the patient treated by a private physician equals that of the public clinic patient.

One question with respect to syphilis morbidity is raised sooner or later: Are these increases "real" increases in incidence, or are they only the results of improved casefinding and reporting? As we see it, increased morbidity at this point reflects both increased incidence and improved reporting. But we have no way of knowing how much is attributable to either.

However, there is one answer to this question. Regardless of what morbidity reports represent, the patients are real, they need treatment, and their contacts need examination. This cannot be denied.

In fact, it may be expected that if our present efforts continue successfully, as I have every hope that they will, morbidity figures will go a lot higher than they are now. But, sooner or later, a point will be reached after which any amount of epidemiological effort can result only in a plunge toward eradication.

## Casefinding in Chicago

**PHILIP R. WACTOR, Jr.**

*Health program representative,  
Chicago Board of Health*

In Chicago, 27 E. 26th Street is an address of unique reputation. It is the Municipal Social Hygiene Center, under the direction of Dr. K. B. Muir. Since 1938, the center has played host to 3 million or more guests who have entered for diagnosis, interviews, treatment, and checkups. Its files hold records dating back to 1934 of 800,000 male patients and 700,000 females, with medical charts of the histories of victims of syphilis.

In a neighborhood which blends, in Chicago style, the slum in retreat, industrial monuments in transition, and modern public housing projects in progress, a fence of iron spears protects the center's spacious and dignified quarters, declared unsuitable for use as a school building 20 years ago.

Here, with limited facilities and personnel, financed by local, State, and Federal funds, a dedicated staff carries on a running battle with

the social and microbial agents of venereal disease.

Not all the patients have venereal disease. Many are negative. They may have almost any form of skin disease. Dr. Seymour Weinstein, chief consultant, has even found a few cases of Hansen's disease among them. Many come in of their own accord. But the bulk of the visitors are invited in through epidemiological investigation.

Consequently, the bearing of most of those who climb the stairs to the registration desk is not happy. Although the receptionist is cheerful and smiling, her brightness touches few of those who wait in the large central reception hall. Thirty or more at a time drape the benches or squat on the hallway stairs. They pay scant attention to the informative exhibit on the south wall. They seldom read leaflets, books, or even papers.

They only sit and wait while the record clerks check their registration cards against the alphabetic file of previous visitors, the phonetic file of names reported by private physicians, and the numerical file of patients with syphilis.

If any are cheerful, they are the few directed to completely separate facilities for receiving, examining, interviewing, diagnosing, and treating expectant mothers, children under 2 years of age, and couples seeking the required premarital examination.

For the patient, the routine of diagnosis, interview, and treatment is an occasion for personal anxiety and relief. For the staff, it is a process which arrests or interrupts the career of agents which, undeterred, could reach from every promiscuous contact to thousands of innocents. The staff sees 5,200 patients in a month. In a year, they treat more than 16,000 cases of gonorrhea. In 1959, this one center reported 7,083 patients with syphilis.

The visitor who brings his chart number is ushered in for a checkup without delay. Others are summoned, by number only, over a loudspeaker system. No names are used.

There are several rooms for diagnostic service, containing private dressing booths and examination facilities. Before treatment, patients diagnosed as positive are called to the second floor for an interview. Each interview

is held behind closed doors. Although the booths are open at the top and far from sound-proof, so much conversation goes on at once that the only distinguishable remarks are those within a booth.

All interviewers are male. It is found that patients are likely to be more responsive to questions from a man. Women as a rule hesitate to admit promiscuity to another woman.

The attitude of the patients varies. Men as a rule are uncommunicative as to female contacts in relation to gonorrhea. They show little or no concern as to those they may have infected. No effort is made to interview women with gonorrhea, as it is felt little is to be gained: the men infected will show up for treatment in any event, soon after they are infected. In 1959, the center treated 16,000 patients, mostly men, for gonorrhea.

Dr. Weinstein is hopeful that the use of fluorescent antibodies may facilitate the prompt diagnosis of gonorrhea in women, with the possibility of detecting and arresting most of the social foci of that infection. There will remain, however, the present difficulties of finding female patients with gonorrhea and bringing them to treatment, since the woman is usually unaware of the infection in its early stages.

#### **More Cases and Greater Efforts**

While scholars hope to reduce venereal disease to the point where it is no more of a public health threat in America than malaria, the center's physicians, epidemiologists, investigators, and aides are dismayed at the rise in the incidence of syphilis.

While the rise in the reported cases of syphilis is in part a result of the superior epidemiology performed at the center, the staff is certain that the increase is also real. This conclusion is based on an increase in the rise of early infectious syphilis and on an increase in the number of positive reports in routine serologies from sources where there has been no special effort at casefinding and reporting.

Dr. Muir takes special pride in the industry, enthusiasm, and proficiency of the epidemiological staff, the "peppy epi" boys, detailed to the city by the Public Health Service. There are four on duty now.

In one year, despite a reduction in staff, the investigators, by improvements in the technique of cluster testing (the contacts, the suspected contacts, and the associates of patients with infectious syphilis), scored impressive gains in the number of infectious cases found and treated.

For the first 6 months of fiscal year 1959, they had 48 source patients with infectious syphilis. In 6 months of the following fiscal year, there were 169 source patients (table 1).

With the increased range of investigation, they found 25 cases of primary and secondary syphilis in the 1959 period, and 116 in 1960. Moreover, 41 of the cases in 1960 were in suspects or associates, cases which would not have been discovered in the infectious stages were it not for the technique of cluster investigation.

The epidemiological service has lost no opportunity to turn up unsuspected cases. A house-to-house survey in a high-incidence neighborhood has succeeded in bringing in 465 patients for treatment, out of 4,338 reactors. Of this number, 23 were infectious syphilitics.

Two other members of the staff are assigned to encourage physicians to report positive diagnoses promptly to the center. One of their special duties is to explain the need for prompt confirmation of a diagnosis reported as positive by hospital or laboratory tests.

Efforts to obtain reports from hospitals and laboratories have succeeded in bringing in reports on 94 percent of the tests administered in the city. In the event that a dark-field examination reveals the spirochetal organism from a lesion, the center is notified immediately. Otherwise, reports of positive diagnoses for the most part are filed monthly.

Hot pursuit of infectious patients is cooled somewhat by an arrangement which obliges the center to defer investigation of private patients reported as positive by laboratories or hospitals. None are interviewed until the patient's physician confirms the diagnosis, and such confirmation waits as long as 2 months. A less significant cooling effect results from the tendency of hospitals, for administrative reasons, to send reports of positive reactors to the center only once a month rather than daily.

Since in the normal course of events a patient may not appear for diagnosis and treatment

until weeks or months after infection, the search for fresh contacts of infectious syphilis begins with a handicap.

Other factors also interfere with detection of infectious syphilis in the early stages. A few patients develop no apparent symptoms. Often the lesions are not in an obvious location. Some develop internally or in obscure positions where even the patient may ignore them. If the lesions are less than classic, the diagnosis may be missed by physicians who have had little or no experience with the disease in recent years.

With the decline in the incidence of syphilis, the staff finds that not all physicians are appreciative of the implications of a positive blood test, or alert to the nature of a rash or sore which may disappear. Leaning with assurance on the efficacy of antibiotics, a physician may be inclined to develop a low index of suspicion, in the opinion of some authorities. During several interviews concerning cases of congenital syphilis, the mothers asserted, "I told the doctor I had this sore, but he said it would go away."

An experienced syphilologist, Dr. Muir is concerned also with the possibility that treated cases of syphilis may relapse. The center physicians seek to persuade patients to return

for a checkup at least once a month for 6 months, and to call again, at wider intervals, for at least a year. Recrudescence of the infection was a characteristic of the disease under earlier forms of treatment, and Dr. Muir feels that this characteristic may persist even under antibiotic treatment.

Her fingers are crossed also lest the incidence of anaphylactic reactions to treatment increase before the disease is eradicated.

Still another obstacle to eradication of the disease is its appearance among men and boys who associate mainly with their own sex, although they compose a major reservoir of infection for both sexes. The relations of such deviates are characteristically promiscuous; one 13-year-old boy named 40 contacts. Another who kept a diary named 38 in one year, and in a succeeding year named 44 others, with no repetition of any of the earlier names. Such contacts, many from the privileged ranks of society, now contribute the majority of those investigated. They lead at the same time to many heterosexual infections.

It is not certain that such patients have a higher incidence of infection than in the past, but the staff believes that the increase in reported cases to a great extent represents a true rise in the incidence.

Table 1. Cluster test progress report, Chicago, Ill.

Item	48 source patients, first 6 months fiscal year 1959			169 source patients, first 6 months fiscal year 1960		
	Contact	Suspect	Associate	Contact	Suspect	Associate
Names obtained	220	153	279	909	396	421
Located and examined	161	125	275	701	336	421
Positives	50	28	32	234	85	27
Infected with syphilis	49	28	20	234	85	27
Brought to treatment	32	16	7	118	41	17
Primary and secondary	19	5	1	75	26	15
Early latent	11	7	1	37	13	1
Other syphilis	2	4	5	6	1	1
Returned to treatment	0	2	1	2	1	0
Adequately treated	17	10	12	114	14	10
Not infected with syphilis	112	97	255	467	251	391
Not examined	59	28	4	208	60	0
Indices:						
Contact index	4.58	3.19	5.81	5.38	2.34	2.49
Epidemiological index	1.02	.58	.42	1.38	.50	.16
Brought to treatment	.67	.33	.15	.70	.24	.10
Brought and returned to treatment	.67	.38	.17	.71	.24	.10
Lesion to lesion	.40	.10	.02	.44	.15	.09
Percent reactive	31.05	22.40	11.64	33.38	25.29	.06
Percent located	73.18	81.69	98.57	77.11	84.84	100.00



Ordinarily, deviates are loath to report a venereal infection or to admit the source. The result is that they are more likely than heterosexual patients to go untreated and to seed infection widely. Apart from the dread of social contumely, they are fearful of criminal penalties. The Chicago investigators, however, by studiously disassociating themselves from police activity, have succeeded in winning their confidence to the extent that most cooperate willingly in reporting contacts and in helping investigators to find suspected contacts.

### The Routine and Some Findings

Typically, an investigator interviews 100 patients a month, all diagnosed as having infections.

If a patient has syphilis, the first step is a field trip by the investigator to the home of the contact, to locate and identify those who may live in the same place.

Ordinarily, except for the importance of a field visit to learn the associates of an infectious syphilitic, investigators pursue their leads by telephone or, if that does not avail, by telegram, for those over the age of 18. By these methods, they succeeded in bringing to examination more than 6,000 of 10,134 persons named in 6 months.

This record is scored despite the notorious reluctance or inability of patients to identify casual consorts. "A Jane on Cottage Grove" is typical of the identification offered. Often the contact's name is unknown to the informant, or it is a false name. On the other hand, the telephone number, if it is recent, will be correct, and the contact will answer to whatever name was given. The name itself, given in good faith, may need translation, as Scott may sound like Skort, Marion like Mann, and Terril like Tull. The spelling of such names also may be as free as the pronunciation.

The center does not deny treatment to patients who offer no personal identification. Any name and address they give is accepted, and it is purely a matter of conjecture how many are duplicates.

Patients use six or more aliases, sometimes without regard to gender. When patients are recorded by the Cook County jail, which tests and, if necessary, treats anyone arrested and

### Syphilis Diagnosis

"Recent publicity emphasizing the frequency of biologic false-positive reactions has made this diagnosis medically 'fashionable.' We join Perry, Kierland, and Magath in their insistence that a positive serologic test for syphilis should suggest a diagnosis of syphilis until proved otherwise."—DRS. GEORGE SCIPLE, C. HUNTER MONTGOMERY, and JOHN M. KNOX, *New England Journal of Medicine*, July 14, 1960, pp. 84-85.

detained for as little as 2 days, all the names by which a patient is known are recorded, and this information is used for the center's records. Such checks help an investigator to know whether a patient is a recidivist with established associations, or a fresh contact.

A technician at the county jail tests 50 to 100 a day, by the rapid plasma reagin method, relying on the patients for aid. Of the lot, 8.5 percent are found positive for syphilis. A similar arrangement for testing and treating is planned for the city jail.

There is no special category of crime associated with venereal disease except for the women who are arrested on narcotics charges. Most of these have resorted to prostitution in order to earn money for drugs, according to the staff. The investigators have the impression that, on the other hand, organized prostitutes use antibiotics liberally to cure or prevent infection.

The number of examinations for venereal disease at the center increased from 43,787 in 1956 to 122,169 in 1959, including the house-to-

Table 2. Syphilis distribution in Chicago, 1959

Type of case	Private patients	Hospital, clinic, or institutional patients	Total
Primary and secondary	209	537	746
Early latent	335	819	1,154
Latent	1,111	3,732	4,843
Congenital	46	291	337
Total	1,701	5,382	7,083

house survey. The number given preventive or curative treatment at the center increased from 5,951 to 7,608 in 1959. The number of infections found in Chicago increased from 21,635 in 1956 to 23,361 in 1959. Of this number, as noted, 16,102 were gonorrhea, 7,083 were syphilis, and 61, other venereal infections.

Of the syphilis cases, most in 1959 were latent, indicating failure of earlier diagnostic efforts (table 2). Most of the primary, secondary, and early latent syphilis patients were men.

The future of control of venereal disease in Chicago is under shadow of the seaway development. All of the ports on the Great Lakes for that matter will see an increase in visitors, including seamen, many of whom will come from lands where the incidence of venereal disease is still relatively high.

## New Haven's Court Clinic: A Casefinding Source

**GUNAR N. BOHAN, M.D., M.P.H.**

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In New Haven, Conn., the chief method of finding sources of venereal disease is the followup of all positive laboratory findings for syphilis, gonococcal infection, lymphogranuloma venereum, granuloma inguinale, and chancroid.

The Sanitary Code of the State of Connecticut, regulation 32, requires all laboratories to report promptly positive findings to the director of health of the municipality where the person affected normally resides, giving the name and address of the patient and the physician, with a duplicate copy going to the bureau of venereal disease, Connecticut State Department of Health.

The sources of these reports are premarital blood tests for syphilis of both partners; prenatal blood tests, mandatory in Connecticut since July 1, 1941; hospitals, where serologic tests for syphilis are performed on all patients on admission, many of which are given in emergency rooms; preemployment medical examinations, which although not required in

Connecticut, include serologic tests in some instances; private physicians; contact investigations; the health department's venereal disease clinic, including voluntary patients; and the New Haven court clinic.

The court clinic proved to be a fertile source of new patients with syphilis or gonorrhea and old patients needing treatment again. New Haven is the only municipality in Connecticut where persons arrested on vice charges are examined for venereal disease by the health department as a routine.

### History

The court clinic began July 13, 1942, at a meeting initiated by the Federal Bureau of Investigation, which was conducting a survey of vice conditions in Connecticut specifically pertaining to organized prostitution. Several conferences were held with public officials, medical authorities, and law enforcement officers.

On July 29, 1942, the health officer of New Haven, Dr. Joseph I. Linde, met with the local representatives of the judiciary, the police department, the county jail's staff, and members of the bureau of venereal disease of the health department to set up more effective machinery for the repression of prostitution and the control of venereal disease in New Haven.

Establishment by the health department of a diagnostic venereal disease court clinic was decided upon, and on September 17, 1942, the court clinic opened its doors. At that time, the law, in connection with court orders for venereal disease examinations, held that if there was no conviction, there would be no court order for examination. The health officer, however, could issue an order for examination if he had reasonable grounds. The clinic operated under this law for about a year with the full cooperation of the city court, the police department, the war council, and the council of social agencies.

Early in 1943, the State legislature made it mandatory, effective October 1943, for every individual arrested for an alleged morals offense, to be examined for venereal disease (section 739-g). This section of the statute was passed more or less as a war measure with

the approval and sponsorship of the Connecticut State Department of Health. At that particular time, as the courts were quite concerned about venereal disease, the law was adopted promptly. This court examination requirement has worked out quite satisfactorily.

### Procedures in Court Clinic

All persons arrested on a morals charge are examined by the court clinic doctor for evidence of a venereal disease prior to trial. On the morning following their arrest, they are brought to the court clinic for that purpose by a probation officer. Persons released on bond are told by the arresting officer or the desk officer to report to the clinic. If they fail to appear, the trial is postponed.

A blood test for syphilis is taken for both men and women. Cultures and smears for gonorrhea are done routinely on women, and on men if indicated. A physical examination is given with attention to the genitalia, mucous membranes, and skin for clinical signs of these diseases.

Records kept in detail show results of examination, charge on arrest, other pertinent

history, results of contact investigation, and disposition of case.

In addition, a report form (VD-13), in duplicate, is filled in by the clinic nurse and physician stating the history, laboratory findings, and recommendations. One copy is sent to court as part of the prisoner's packet through the city attorney's office, and after the case is terminated, filed at the city court clerk's office as part of the permanent file. Another copy is sent to the bureau of venereal disease of the State department of health.

The clinic interview usually provides the only opportunity for the nurse and physician to talk with the patient. At this time, information regarding contacts, previous history of venereal disease, and any other pertinent facts are taken in as much detail as the patient is willing to give.

If the laboratory findings are negative, the patient is notified and discharged from the clinic. When laboratory findings are positive, arrangements are made for treatment.

When a patient is found to have venereal disease, the report is given to the city attorney. This information is given so that the judge may place the person on probation or commit him, if requested by the clinic physician, in order that treatment may be administered. Patients are usually cooperative.

All contacts to cases of venereal disease found by the court clinic are followed in the same manner as other contacts. The court clinic is for diagnostic purposes only. The individual is afforded the choice of treatment either in the health department venereal disease clinic or by a private physician.

### Statistics

During the period 1943-59, excluding 1948 on which no data are available, a total of 4,733 persons were examined at the New Haven court clinic. Of this number, 413 (8.7 percent) were positive for syphilis and 280 (5.9 percent) had gonorrhea. All were placed under treatment.

Compared with the other two compulsory examinations, premarital and prenatal, the court clinic is proving to be an economical casefinding measure. A total of 400,392 premarital blood tests, performed by the State

**Results of examination of court cases for venereal diseases, 1943-59, New Haven (Conn.) Health Department**

Year	Number persons examined	Positive for syphilis		Positive for gonorrhea	
		Number	Percent	Number	Percent
1943	229	26	11.4	15	6.6
1944	221	38	17.2	30	13.6
1945	177	34	19.2	13	7.3
1946	172	29	16.9	23	13.4
1947	181	18	9.9	13	7.2
1949	257	22	8.6	21	8.2
1950	256	18	7.0	14	5.5
1951	269	17	6.3	7	2.6
1952	331	41	12.4	7	2.1
1953	369	25	6.8	17	4.6
1954	363	21	5.8	14	3.9
1955	426	32	7.5	13	3.0
1956	423	18	4.3	9	2.1
1957	382	41	10.7	42	11.0
1958	293	10	3.4	26	8.9
1959	384	23	6.0	16	4.2
Total	4,733	413	8.7	280	5.9

NOTE: 1948 data not available.

department of health laboratories, yielded for the corresponding years only 3,679, or 0.9 percent, positive results. A total of 361,538 prenatal blood tests gave a positive percentage of only 0.4 percent.

These two blood-testing laws have definitely contributed to syphilis control, but examination of persons arrested on vice charges has brought to treatment more patients not only with syphilis but with gonorrhea.

The results of the court clinic clearly indicate that casefinding should be directed to those who are promiscuous.

The law dealing with premarital and prenatal examinations requires only a serologic test. Although a complete physical examination is recommended, the main emphasis is placed on the control of syphilis. The reservoir of undiagnosed gonorrhea in the female is one of the reasons why this venereal disease ranks second among reported infectious diseases in the United States. The court clinic, nevertheless, has been valuable in the detection of gonorrhea.

Establishment of the New Haven court clinic has also demonstrated that a health department with good leadership can, with the cooperation and joint effort of different agencies,

provide the community with effective venereal disease control facilities.

In all other municipalities throughout Connecticut, the court refers persons arrested on vice charges to private physicians for venereal disease examinations. Each physician is paid on a fee basis by the State department of health, as required by law.

The New Haven plan, with the health department primarily responsible for finding venereal disease, has the advantage of facilities necessary to follow up positive cases and possible contacts.

### Summary

The New Haven court clinic has proved to be a valuable venereal disease casefinding source.

There should be more emphasis on sustained venereal disease programs directed to groups of individuals who are known to be promiscuous.

All physicians should be aware of the fact that gonorrhea in females may be present and undetected unless vaginal smears and cultures are carried out.

Local health departments should take the leadership with cooperation of others in venereal disease control.

## National Water Pollution Conference

A vigorous discussion of water pollution problems was recommended by Arthur S. Flemming, Secretary of Health, Education, and Welfare, for the National Conference on Water Pollution to be held in Washington, D.C., December 12-14, 1960. The conference, which is receiving support of civic, industrial, and labor groups throughout the country, is expected to be attended by more than 1,000 of the Nation's leading professional and technical people in the field as well as by representatives of national organizations.

At a meeting of the conference's steering committee held in August, Secretary Flemming set two objectives for the conference: substantial agreement on national goals for water pollution control and the specific programs needed to reach these goals.

Surgeon General Leroy E. Burney pointed out that the United States is headed for a water crisis in the current decade unless the American people do a much better job of cleaning up the country's resources. The need for water supply and pollution control facilities "will continue to grow during the 1960's," he said, "as a result of population increases, the further concentration of people in metropolitan centers, and sharp increases in the use of water by households, farms, and industry."

Partly because of public apathy, the United States has accumulated a huge national deficit in these facilities, he said, warning that "we can no longer neglect this vital segment of the national economy without storing up serious trouble for the future. We need to apply more sanity to sanitation."

# THE VENEREAL DISEASE CONTACT INTERVIEW

A sensitive analysis of interviewing techniques used in social disease control as taught in the John Friend Mahoney Training Center for Nurses was presented during the Venereal Disease Seminar in Baltimore, April 29, 1959. A joint project of the Public Health Service and the Department of Health of New York City, the training center was founded in Brooklyn, N.Y., in March 1957 in response to the demand of public health nurses for more skills and knowledge in venereal disease control, a demand that mirrored rising rates of infection in these diseases. Participation in control activities by nurses in large cities had dwindled following the initial, spectacular success of antibiotic treatment and the innovation of interview-investigations.

The papers discussing the work at the center were delivered by Julius Buchwald, M.D., psychiatrist and consultant to the center; Josephine Omura, R.N., mental health consultant nurse with the Department of Health of New York City; Grace I. Larsen, R.N., senior nurse officer, Public Health Service, who is project director at the center; and Patricia I. Heely, R.N., director of the health department's bureau of public health nursing. Following is a compilation of these papers, in summary.

## The Curriculum at the Center

With the aim of making venereal disease control an integral part of the public health nurse's services, the John Mahoney Training Center for Nurses gives a 2-week refresher course monthly, September through June, stressing epidemiological principles and contact interviewing. Among the topics are: recent advances in therapy, laboratory aids and their interpretation, casefinding methods, the social and emotional implication of venereal diseases, and the relation between their control and other community services. Emphasis throughout is on the adolescent. Nursing, mental health, and medical consultants of the city health department and the Public Health Service teach through group discussions, lectures, and demonstration and analysis of in-

terviews. These experts are also available for student consultation.

During the first week, interviews are demonstrated by the project staff, and during the second, the nurses practice interviewing. Each interview is analyzed by the student group, under guidance of the staff and consultant psychiatrist. Evaluation of course components is constant for the purpose of improving teaching methods and program objectives.

## The Indirect Interview

The indirect interview has provided a valuable communication tool in many areas of medical and social investigation. It was in the natural course of development that this tool was

applied to communication with patients suffering from venereal disease. Just as the microscope, based on understanding of lenses and light, opened a new pathway for exploration of a heretofore invisible world, so does the indirect interview, based on psychiatric understanding, open a new pathway for exploration of human behavior. It is the behavior of the carrier on which the spread of venereal diseases depends. Any attempt to curb the spread of these diseases must necessarily cope with the subtle shadings and nuances within the character of the human vector. While the indirect interview is helping us to understand the motives, fears, character traits, and defenses of the patient, it also lights the pathway to successful contact finding, education, prevention, and cure.

The indirect interview is a purposeful interaction between two people, a conversation which follows a seemingly circuitous path through emotions, eventually finding its way to a nucleus of facts ordinarily unattainable. The foundation of the interview is a positive relationship which can best be defined in terms of the patient's impression of the interviewer. Such an impression would ideally include such phrases as: "She is willing to listen." "She seems to understand." "Perhaps this is the place I can be helped."

There are no dark secrets to establishing a positive relationship. Grandmother used to say, "If you get a person to like you, he will give you what you want." We may prefer using such terms as "obtaining a positive transference," "developing rapport," "building a sense of respect and confidence," but it all amounts to the same thing. We want the patient to like us and work with us toward a mutually gratifying goal, the eradication and prevention of disease.

The materials that build a positive relationship are as obvious as they are elusive. Ordinary courtesy, including a friendly smile and handshake, will never be outmoded. An introduction in which the interviewer offers his name and explains his position and function in the organization can help dispel anxiety. Although adolescents and children frequently are called by their first names, it is a good idea to address young and older adults by their last

names prefixed by Miss, Mrs., or Mr. The interview, other than the brief introduction, should not start or end in crowded corridors.

The patient's wish to maintain confidence can best be respected by starting the interview after the patient and interviewer are seated in a quiet, well-lighted, adequately furnished interviewing room. The walk to the room, however, does not necessarily have to be in stilted silence; an appropriate remark, such as "We can talk more comfortably here," can be made. This tells the patient that there will be talking and that the prying eyes and ears of outsiders are excluded. If the patient appears particularly guarded and cautious, it may help at the onset to say something like: "What we say here will be kept in complete confidence."

Opening remarks should be brief but should stimulate the patient to talk spontaneously about himself and his difficulties. With experience comes a natural ease and ability to say the right thing at the right time. For example, an opening statement may be: "Well now, I'd like to get to know something about you and perhaps learn if there is any way I can be of help. Can you tell me what brought you to the clinic?" Or the opening remarks may be determined by what the interviewer notices in the waiting room or on the way to the office. For example, if the nurse notices the patient conversing with someone while in the waiting room, she may ask, "Someone with you today?" In one interview conducted at the Mahoney Center, this question led the way to learning about a patient's relationship with his uncle. What was learned about the relationship gave us considerable insight into the patient's fears and needs and directed the course of the entire interview.

Another patient, while accompanying the nurse to the interviewing room, revealed a mild limp. Here an appropriate start could have been, "Having some difficulty?" On the surface, the patient may merely be explaining the physical difficulty, but in doing so he is giving the interviewer a wealth of information regarding his handicap, his ability to cope with difficult situations, as well as his reactions to candid questions from someone who appears concerned.

Professional workers frequently avoid reference to an obvious physical handicap of a pa-

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## The Indirect Interview

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been separated since I was 13; I stayed with my mother until 6 months ago when she passed away.

*Nurse:* Oh! I see.

*Patient:* Yes, after she died I had no one else down there so I came up. I've been lucky. Got a good job, but it still gets lonely up here. I have no family here and do the best I can to make friends. I guess you have to take what you can get when you can get it. Seems its been like this a long time.

*Nurse:* Perhaps this feeling of loneliness is connected with the trouble that brought you to the clinic.

*Patient:* Maybe you have got something there. I have had this trouble before.

*Nurse:* Oh. Tell me about that.

*Patient:* Well, it was about 4 months ago. I was just kicking around and I met this fellow Joe who invited me to a party. When I got there . . .

This example, of course, is an ideal one. It implies that a relationship has been established and the patient wants to talk about himself. At the same time, it points to several problems that are characteristic of the indirect interview. First of all, this technique takes time. It is necessarily circuitous and brings in seemingly superfluous information. For that reason, time limits are necessary. We have found that setting a minimum time limit is as important as setting a maximum limit. Naturally, the maximum time you can spend with a patient depends upon the pressure of other responsibilities. Perhaps a 30- to 45-minute interview period can, for the start, provide an optimum amount of time for the exchange of thoughts. The minimum time limit can be considered as a margin of safety in coping with our own anxiety and tolerance of the interview situation. A resistant, provocative, hostile, or silent patient may frequently tempt us to terminate the interview prematurely. The patient, in spite of his outward resistance or hostility, will frequently view early termination as rejection and lack of concern on the part of the interviewer. Furthermore, it is frequently surprising and gratifying to find a seemingly fruitless 10-minute introductory period gradually evolve into a meaningful interpersonal experience.

The second problem raised by this technique

is the mounting tension and anxiety felt by the interviewer. As the tools and rigid framework of the direct interview are dropped, the interviewer frequently finds herself on unknown territory, facing facts and feelings she didn't plan to meet. To listen to a patient struggling for the right words to express hidden emotions is quite different from receiving brief yes and no replies to matter-of-fact questions. No doubt, there are times when we would all like to revert back to the good old question-answer format, sidestepping the vital issues that remain uncovered. Perhaps the knowledge that good interviewing does provoke anxiety may make it easier to recognize our inner tension when it appears. The knowledge that the effort will be more than repaid by hitherto unachieved rewards can perhaps make it easier to cope with the anxiety.

Another contributor to the interviewer's anxiety may be the fact that the subject of sex and venereal disease has always carried with it many overtones of social and personal bias. The relatively free discussion of these subjects in the open-ended interview taxes the interviewer's ability to cope with these ideas in a candid and unprejudiced manner. This does not mean that the interviewer is expected to be able to, or should, strip herself of personal feeling and taste, based on a lifetime of experience. It merely asks that the interviewer be aware of her own personal biases. By coming to grips with how she feels about a patient who has acquired a venereal disease, the interviewer will be able to consciously refrain from imposing such biases upon the viewpoint and attitudes of the patient.

Let us turn for a moment to the frequently expressed concern over what to do with the patient who opens up too much. The fear that the dam will burst by an overwhelming flood of human emotions provoked by the indirect interview technique is a chronic source of anxiety to the interviewer, especially the novice. Yet, experience has shown that the dam rarely floods and personality structure tends to inhibit rather than to give free rein to emotion. At this point, many of you may think, "Yes it does happen rarely, but it's just my luck that it will happen to me; then what will I do? How will I handle such a patient?" To this let us say that most of us have the intuitive capacity to



tient, especially when the handicap is chronic. Quite the reverse is true when a patient appears with his arm in a sling. In a professional setting, reference to any handicapping condition can denote interest and concern on the part of the interviewer and could well be used as a means of fostering a positive relationship.

### The Expander Question

Expander questions during the interview offer another way of helping a patient talk spontaneously about meaningful and emotionally laden facts. The more a patient talks, the more he may want to talk, and the more he gets to like the listener.

An expander question differs from a direct question in several important ways. If you ask a direct question, you will get an answer, but that is all you may get. On the other hand, an expander or open-ended question opens a pathway to new facets of a patient's behavior and problems. Characteristically, a good expander question cannot be answered with one or even a few words. On the contrary, it forces the patient to probe, explore, confide, and learn. Where expander questions lead into emotionally laden material, they also uncover the most meaningful facts. Whereas the direct question usually takes its cues from isolated facts, the expander question takes its cue from feelings.

Examples of expander questions can be as numerous as there are varieties of situations which arise in the interview setting, but a question appropriate at one time, may be grossly inappropriate a few minutes later. Again, experience, intuitive capacity, and constant and full awareness of the patient's changing emotional tone are the best leads to the right questions asked at the right time. Opening questions such as, "Tell me about yourself," may be followed with, "What brought you to the clinic?" "Tell me more about that." "Are there other difficulties?" "I don't understand." "How do you feel about that?" "In what way?" "How does this show itself?"

Many times one or two words with the proper inflection and facial expression will do the job. For example, saying "Oh?" in response to a patient's statement may show interest and convey the message that you want to

hear more. Simply repeating the last word or words of a patient's statement can indicate your interest as well as pave the way for further thoughts on a subject.

Nonverbal expander questions guide us and therefore play an important role. An appropriate change in the angle of one's head, a lifting of an eyebrow, a well-timed smile, or an understanding expression of concern all can go a long way in helping the patient talk. Summarizing and clarifying what the patient has been saying can frequently focus a problem more clearly and aid in the exploration of new facts. For example, a patient talks of her problems in rearing four small children, meeting bills, frequent family illness, and the recent death of a relative. An appropriate expander at this point may be, "The going gets rough doesn't it?" Such a remark may lead the patient to further exploration of her emotional reaction to the events described, or, as sometimes happens, she may respond with, "Yes, but it's not always so rough." "Oh?" asks the interviewer; and, if the stage is set and the patient is ready, we may hear facets of the patient's life that are rewarding and make the "battle" worthwhile. The following example briefly compares the direct and indirect interview techniques. A patient has told the nurse that he recently came north to live. The direct interview would run something like this:

*Nurse:* When did you come north?

*Patient:* Six months ago.

*Nurse:* Do you like it up here?

*Patient:* Yes.

*Nurse:* Working now?

*Patient:* Yes.

*Nurse:* Do you like your work?

*Patient:* Yes.

*Nurse:* You have acquired your infection since you came up north?

*Patient:* Four weeks ago.

*Nurse:* What was the name of the girl?

*Patient:* I forgot.

The indirect interview may take this course:  
*Nurse:* Then you have been living here only a short time?

*Patient:* Yes, I decided to come up 6 months ago.

*Nurse:* Oh? Tell me about that.

*Patient:* Well, my mother and father had

Many patients will express a healthy curiosity about venereal disease, a curiosity which has heretofore remained unsatisfied. However, the freedom to express such curiosity is directly dependent upon the nature of the relationship, the absence of personal bias and prejudice, and the presence of helpful and refreshing candor. In answering questions, it is necessary to know the specific thought behind the question, as well as what the patient already knows. It is helpful, therefore, to meet a patient's questions with the question, "Why do you ask?" For example, a patient asks, "I guess the only way you can get this disease is when a man and woman have sexual intercourse." The interviewer is tempted to answer with a brief "Yes," but instead pauses and asks, "Why do you ask?" The patient is embarrassed, but now finds the courage to state, "Well, I didn't want to talk about this, but I haven't had any girl friends." Further exploration of this difficulty may lead the patient to submit the names of homosexual contacts, and if a conflict in his sexual behavior is discovered, perhaps he can be referred to appropriate sources for further counseling and help. Thus, the exploration of a patient's question will help reveal hidden facts, and will often bring to light conflicting and anxiety-provoking fantasies which require airing and resolution.

That learning about venereal disease is necessary for self-preservation may be an accepted fact to us, but the patient may not appreciate this as readily as we do. The indirect interview, having given us a fund of background knowledge as to the patient's problems and meaningful life experiences, now gives us the opportunity to demonstrate to the patient a connection between past difficulties and his present problem. For example, a patient told how as a youngster he had lost a finger in an accident while working on his father's farm. The fact that the accident occurred in a careless split second, but left a deformity that would endure a lifetime, gave the interviewer an excellent opportunity to connect the patient's experience with his present problem with venereal disease, as well as with his proneness to act impulsively and cause irreparable damage. It is connections such as these that help make learning meaningful and memory enduring.

Our third basis for learning takes us back to the relationship between the interviewer and patient. It is our hope that knowledge acquired within a nonpunitive and helpful setting will be incorporated within the day-to-day living habits of our patients. Just as we tend to forget unpleasant experiences, we tend to forget facts that have been learned under unpleasant circumstances. Facts that have been learned as a part of a positive experience during a successful interview may more readily be used when new situations in the patient's life demand recall of past experiences.

### Obtaining Contact Information

It is no accident that we ask for contact information toward the end of the interview rather than at the beginning. It is hoped that the positive relationship established during the interview will help the patient assume his responsibility in the situation by giving the information requested. Although it is not the purpose of the interview to offer psychotherapy, many patients have welcomed the opportunity to air their difficulties within the objective and nonjudgmental setting of the indirect interview. During the interview, the patient comes to recognize the interviewer as a helpful and responsible listener, a recognition which motivates the patient to assume the responsibility of providing contact information. Thus, we have tried to have the patient consider us as a source of help and to get him to like us. We have tried also to offer information of value to the patient, and we now expect that he will give us information that we need—contacts.

Finally, let us consider the matter of tactics and strategy in our war against venereal disease. Whereas the isolated casefinding, individual interview, and routine treatment of the patient constitute our tactical procedure, the strategy of our method must take into consideration an occasionally intangible but profoundly important attitude that has crept into the community and directly affected the potency of public health control efforts. At the Mahoney Center, we have had the opportunity to observe a community attitude that presents itself in subtle submissiveness, but rests on a hostile and fearful approach to authoritarian institutions.

recognize the severely disturbed patient, curb our probing, offer occasional reassurance, and shorten the interview. In 2 years of experience at the Mahoney Center, there has been no instance in which the interview got out of hand. On the contrary, a patient frequently remarks that he "feels good," at the close of an interview. Almost always, the patient will let us know when we are "stepping on his toes" by his silence, shifting to other subjects, as well as using other defensive maneuvers which help the patient retain an emotional homeostasis. Our major efforts with this technique of interviewing rest in handling rather than fearing the absence of the patient's resistance.

Anything which hampers communication may be considered to be resistance on the part of the patient. It may be a thought which is difficult to express, a feeling which demands suppression, or a generally guarded attitude which has become part and parcel of a personality structure strained by a lifetime of probing and prying at the hands of punitive authority figures. The manifestations of resistance are multiple and demand considerable flexibility and adeptness on the part of the interviewer. A frequent form of patient resistance is silence. It is amazing how 15 seconds of silence can seem to be 15 hours. The resultant anxiety frequently tempts the interviewer to break the silence by changing the subject. Yet, since the silence represents an important thought which the patient finds difficult to express, valuable information may be gleaned if the patient, rather than the interviewer, breaks the silence. If a period of silence becomes overly long and provokes too much anxiety, the silence may be terminated by the interviewer asking, "What are you thinking?"

One sometimes meets a patient who candidly refuses to talk about a particular subject. Here an explanation of why the patient refrains can frequently reveal hidden problems, fears, and needs. Blushing and obvious embarrassment may make it necessary for the interviewer to offer reassurance. For example, a patient may be helped through a difficult moment by a statement such as, "I know that some of this is embarrassing to you, but I have come across these difficulties before and the more you tell me about it, the more I can understand and help." Ask-

ing for contact information, a focal point of the interview, is more likely to meet with a successful response if it is introduced after a positive working relationship has been developed between the patient and the interviewer.

Workers at the Mahoney Center have encountered a strange, misleading form of resistance. We are referring to the patient who enters the interviewing room, hardly waits for any introductory remarks, and quickly spurts out: "I think I know what you want. I caught the infection 5 days ago by having intercourse with Jane Doe who lives at 10 North Street. If you don't want to bother sending her a letter, I'll bring her in myself so she can be treated. Can I leave now?" Since this is all usually said in one breath, we may not have the time to realize that under the guise of golden cooperation, we have met iron-clad resistance. The inexperienced interviewer may well be tempted to close the interview at this point, feeling, "Why go on? He has told me what I want to know. What do I have to lose?" In actuality, closing the interview at this point means losing a great deal, for again, we would lose the opportunity to form a relationship with a patient who could potentially carry our message out to the community. This type of patient further reflects a dangerous, though presumably submissive, attitude, which will be discussed further.

### **Education of the Patient**

The indirect interview and the relationship it promotes set a flexible, useful stage for the education of the patient. Perhaps in recalling experiences with learning, even on the elementary school level, there are few who do not remember the so-called "born teacher" who lives on in our memory as a good and wonderful person whose lessons were a pleasure to learn. We seem to learn most things for three basic reasons:

- To satisfy an instinctive curiosity, the epistemophilic instinct to which Freud referred.
- To profit from past experience for the purpose of self-preservation and the promotion of a happier future.
- To please and receive praise from a teacher we have learned to like.

# A Reappraisal of Benzathine Penicillin in Gonorrhea Control

GEORGE W. SCIPLE, M.D., WILLIAM O. HOSKING, M.A., and C. HUNTER MONTGOMERY, M.D.

THOSE concerned with public health problems have been frustrated in attempts at reduction of the high incidence of gonorrhea. Penicillin therapy, combined with carefully perfected epidemiological procedures, resulted in a tremendous decrease in morbidity from primary and secondary syphilis. The utilization of the same drug, in conjunction with epidemiology modified to fit the needs of gonorrhea, has resulted in only a modest decrease in reported cases of gonorrhea over the last 10 to 12 years.

Recent attempts at solution of the problem of gonorrhea control have been based upon the modifications of epidemiological procedures and therapy. Efforts directed toward modifying the epidemiological procedures resulted in the adoption of what was known as "speed zone" epidemiology. When this approach failed to produce overall outstanding results, long-acting penicillin was added to the former therapeutic regimens to try to produce a period of "antibiotic quarantine" during which the patient could not be reinfected. The objective of this form of therapy was to decrease the incidence of gonorrhea.

Male patients of the venereal disease clinic of

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*Dr. Sciple, of the Technical Development Laboratories, Communicable Disease Center, Public Health Service, is the former director of the venereal disease clinic, Houston Health Department, Houston, Tex. Mr. Hosking is health program representative, and Dr. Montgomery is the present director of the clinic.*

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the Houston Health Department were treated with benzathine penicillin in addition to the usual procaine penicillin regimen, following in general a method reported by Hookings and Graves (1), for two purposes. The first was to find whether, by this means, male patients with gonorrhea could be adequately treated and effectively protected by an antibiotic quarantine against reinfection for 32 days. The second purpose was to determine the efficacy of the method in reducing the incidence of gonorrhea.

## Methods and Results

All male patients coming to our clinic for the first time with a clinical diagnosis of gonorrhea, except those sensitive to penicillin, were treated on one of four regimens, and are included in this study. Calendar periods during which the regimens were used were as follows:

Time interval	Treatment schedule	Number patients
Apr. 1, 1954, to Mar. 31, 1955.	600,000 units procaine penicillin with 2 percent aluminum monostearate in oil (PAM).	958
Apr. 1, 1956, to Mar. 31, 1957.	600,000 units benzathine penicillin.	1,075
Apr. 1, 1957, to June 1, 1958.	900,000 units PAM and 900,000 units benzathine penicillin.	1,331
Nov. 10, 1958, to Feb. 20, 1959.	1,200,000 units aqueous procaine penicillin and 1,200,000 units benzathine penicillin.	258

The patients were carried through our regular clinic routine. Contact investigation was carried out, and sex contacts were treated. No attempt was made to determine whether study patients had relapsed or were reinfected. Any

This is an attitude characterized, in a sense, by the patient described before, who quickly offers the name of a contact (a name, by the way, which frequently exists only in the imagination of the patient) and wants no further part of a relationship with the nurse or the services she represents. The furtive responses of some patients who have come to get that needed "shot of penicillin" reflect the fact that something, somewhere has gone wrong. Also, when shame and fear remain attached to treatment and illness, there is another warning sign that our strategy is in need of repair. The patient who timidly seeks to bribe us with the name of a contact so that he may get treatment must feel that he is stealing something which is rightfully his and which he should be able to accept with

an uninjured sense of self-respect and human dignity.

Here, then, lies our strategic goal. At the Mahoney Center, we hope to improve our interviewing techniques so that the resultant positive relationship between nurse and patient may gradually be transferred to the relationship between community and social hygiene clinic. It is our hope that many individual interviews which provide a positive and helpful experience will lead the community to accept the clinic as a place where one can get help, considerate attention, and courteous guidance untinged by authoritarian or punitive demand. This is a long-term goal that requires continuous effort and study. It calls for hard work, but it is a goal that is well worth the effort.

## Resolutions Passed on U.S.-Mexico Border Health

Marking another year of creative, binational action to lift the level of health along the common border, the 18th annual meeting of the United States-Mexico Border Public Health Association was held April 4-8, 1960, at Hermosillo in the State of Sonora, Mexico. The meeting offered an agenda of papers and panel and roundtable discussions on subjects such as environmental sanitation, venereal disease, maternal and child health, tuberculosis, and poliomyelitis.

Among resolutions passed at the close of the sessions were those concerned with:

- The association's approval of development projects such as community water supply programs.
- Continuation of the interchange of experience and knowledge by public health nurses in the United States-Mexico border area.
- Recruitment of all other interested agencies and groups to work with the association toward the early eradication of tuberculosis in the border States.
- Continuation and broadening of the close cooperation between border health agencies in venereal disease control in all border com-

munities to further the training of health agency workers in venereal disease casefinding techniques and to increase the scope and efficiency of control programs.

- Further stimulation of specific training of nurses to aid in the early discovery and care of cases of infant diarrhea on the basis of oral rehydration and to assist in the promotion of local committees for the dissemination of information about these methods of controlling diarrheal disease.
- Encouragement of communities with a high occurrence of diarrheal disease to promote health and environmental surveys.
- Recommendations to officials along the border that they provide health workers with facilities for attendance and study at the association's annual meetings.
- Arrangement for joint publication of the proceedings of the association in the *Boletín* of the Pan American Sanitary Bureau, *Public Health Reports*, *Higiene*, and *Salud Pública de México*.

A summary of other events of the meeting will appear in the December 1960 issue of *Public Health Reports*.

lation was one-fifth greater during the time of treatment with a 2.4 million unit schedule than during the period of treatment with 600,000 units of PAM, then the chance of reinfection of those treated would also be one-fifth greater.

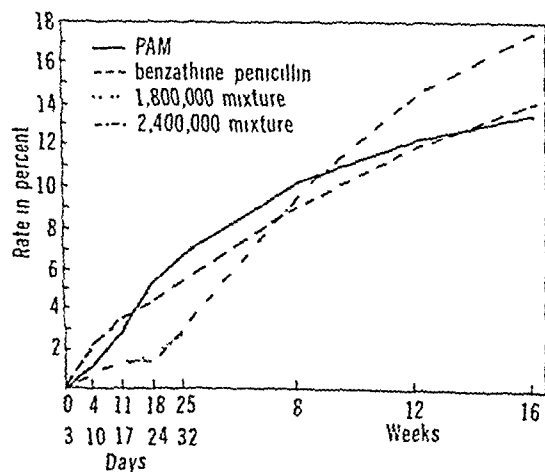
Adjusting the 16-week retreatment rate for this increase in probability of becoming reinfected, a retreatment rate of 14.06 is derived for the 2.4 million unit schedule, as compared with 14.00 for the 600,000 unit schedule. When this adjustment is made, the foregoing studies all show quite similar retreatment rates at the end point.

It is interesting to note that investigators in Great Britain have found retreatment rates comparable to those presented. Willcox reported retreatment rates of 14.8 percent at the end of 3 months in a group of white patients treated with an oral penicillin preparation (2). Dallas reported a treatment failure rate of 14.1 percent at 3 months in a series of 447 male patients treated with 300,000 units of procaine penicillin at St. Thomas Hospital, London (3).

Our data show that the use of benzathine penicillin in the therapy of acute gonorrhea in men offers no discernable long-term advantage to our gonorrhea control program. There are, we believe, several disadvantages to the use of this agent.

The most obvious disadvantage is the added cost of therapy with benzathine penicillin. It is several times that of an equivalent unitage

Figure 3. Cumulative retreatment rates for 3,622 male gonorrhea patients in 16 weeks following therapy, Houston, 1954-59



of procaine penicillin with 2 percent aluminum monostearate in oil, for instance.

Another and very considerable disadvantage to the use of benzathine penicillin is the persistent discomfort at the site of injection. This pain we believe to be severe enough to inhibit the patient's return to the clinic should he become reinfected. Perhaps the short-time failure rate is actually the same with all schedules, but the recent memory of persistent discomfort of the benzathine penicillin injection inhibits the return of patients who are treatment failures until, with passage of time, memory of pain fades while persistence of symptoms becomes worrisome enough to stimulate their return. This factor could well contribute to the "antibiotic quarantine." In addition, we suspect the associated pain may well drive our patients to sources of therapy, both legal and illegal, where no epidemiology is carried out.

We find that use of benzathine penicillin in men often tends to confuse the epidemiological picture in gonorrhea control. Most of our male clinic patients are aware of the short incubation period of the disease, but unaware of the period of antibiotic quarantine provided by the drug. When the patient returns to his unnamed, untreated, and still infected sex partner and is not almost immediately reinfected, he assumes her free of the disease. When reinfection does ultimately occur, he is unable to associate his reinfection with its actual source. Under these circumstances, patients are not easily persuaded to reveal the identity of their sex partners to the epidemiological investigator.

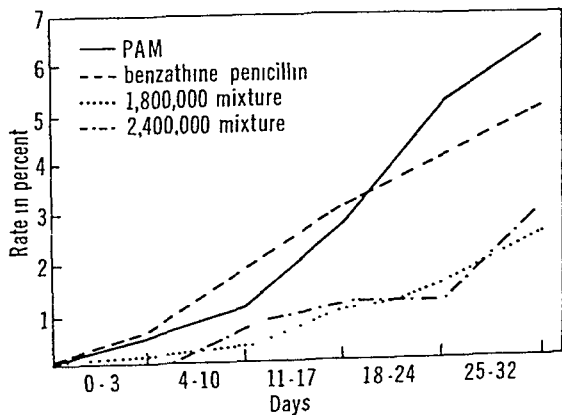
The chances for the development of penicillin-resistant strains of gonococci would seem to be enhanced when long-acting penicillin is given to promiscuous persons who are members of a socio-sexual group having a high gonorrhea prevalence. When persons with persisting low levels of penicillin in their blood are repeatedly exposed to numerous sexual partners, and consequently to varying strains of gonococci, it is likely that organisms which are penicillin resistant will eventually be selected. Such a situation would essentially reproduce the cultural conditions that are used in the laboratory to produce drug-resistant bacteria. Since there appears to be a theoretical possibility of promoting the evolution of

study patient who was again diagnosed and treated for clinical gonorrhea during the observation periods is considered a treatment failure.

During most of the period covered by this study, bacterial cultures were not available to us as a routine diagnostic aid. For this reason all patients were diagnosed on clinical findings and subsequently treated. When bacterial cultures became available late in this study period, we made a comparison between two groups of patients. One group consisting of 258 patients were diagnosed on clinical grounds; the other group of 448 patients were diagnosed on cultural grounds. We found no significant differences in retreatment rates between these two groups. Patients with nongonococcal urethritis composed only a minute fraction of men coming to our clinic for the first time with acute anterior urethritis.

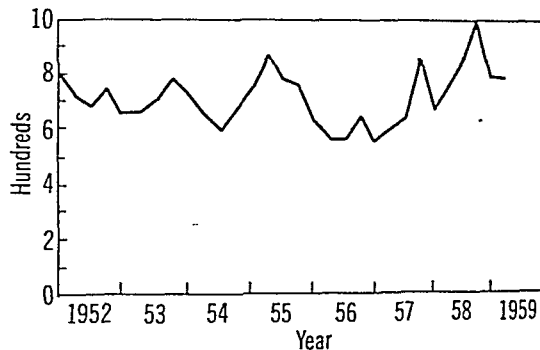
Retreatment rates for the first 32 days following therapy in the four schedules are shown in figure 1.

**Figure 1. Cumulative retreatment rates for 3,622 male gonorrhea patients in 32 days following therapy, Houston, 1954-59**



In brief, these data show the higher cumulative retreatment rates at the end of the 25- to 32-day period were with the single agents when used in smaller dosages. The lower retreatment rates were achieved by combining the short-acting and long-acting agents, with concomitant increase in the total dose given. These lower retreatment rates may be due to fewer relapses, fewer reinfections, or other intangible

**Figure 2. Gonorrhea morbidity, Houston Venereal Disease Clinic, 1952-59**



factors. These rates suggest that patients were indeed protected from reinfection by the period of antibiotic quarantine secondary to prolonged penicillin blood levels.

If this reduction in return rates is to be of more than academic interest, it must somehow affect gonorrhea incidence. In Houston we were unable to show any effect on incidence, because the actual incidence of gonorrhea is unknown, due to minimal case reporting by private physicians. We do have, however, exact figures for our clinic gonorrhea morbidity (fig. 2). We find no correlation between these morbidity figures and the application of our various treatment schedules.

Since we needed a means of evaluating the efficacy of these schedules, we extended our period of observation from 4 weeks (25-32 days) to 16 weeks. By so doing, we obtained an internal comparison of relapse/reinfection rates among the several schedules. With this extended observation period, the cumulative retreatment rates vary only from 13.89 percent to 17.42 percent between the several therapeutic regimens (fig 3). The maximal difference lies between two very similar schedules, both utilizing mixtures containing the long-acting drug.

When a study such as this is conducted over a long period of time, there is always chance that factors other than the controlled ones will influence results. During the period when the 2,400,000 unit mixture was administered, 19.3 percent more cases of gonorrhea were seen in the Houston clinic than in the time period when the treatment schedule was 600,000 units of PAM. It seems reasonable to believe that if the chance of acquiring gonorrhea in this popu-

# Treponemal Tests in Diagnosis of Syphilis and Biologic False Positive Reactors

NICHOLAS J. FIUMARA, M.D., M.P.H.

THE ERA of the treponemal tests began in 1949 with the introduction of the *Treponema pallidum* immobilization (TPI) test by Nelson and Mayer (1). The TPI test was followed in 1955 by the *T. pallidum* complement fixation (TPCF) test, developed by the Public Health Service (2).

The TPCF test has been almost entirely replaced by the Reiter protein complement fixation (RPCF) test established in 1957 (3-5). This test employs the protein fraction of the nonpathogenic strain of *T. pallidum*, originally described by D'Alessandro and his co-workers in 1949 (6,7). Since the Kolmer technique is used in the RPCF test, the procedure is also referred to as the Kolmer-Reiter protein complement fixation test (KRPCF). A new treponemal test, the fluorescein tagged antibody (FTA) test (8) is still under study and is not available for general use.

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*The RPCF and the TPCF tests for this study were performed under the supervision of Genevieve O. Stuart, chief serologist, State Wassermann laboratory. The TPI tests were performed under the direction of Dr. Irving H. Blank, department of dermatology and syphilology, Massachusetts General Hospital, Boston.*

There are three uses for treponemal tests: (a) to help distinguish between biologic false positive and true positive blood tests for syphilis; (b) to help establish a diagnosis of syphilis in patients who have clinical evidence of the disease, particularly evidence of late syphilis, but who have negative blood and spinal fluid serologic tests; and (c) to assist in the diagnosis of syphilis in patients with epidemiological evidence of the disease but with negative clinical and serologic findings (9,10).

The division of venereal diseases of the Massachusetts Department of Public Health performs both the TPI and RPCF tests at the request of private physicians and hospitals. The TPI test has been performed for patients of private physicians since 1955. The TPCF test was added in 1956 but was replaced by the RPCF test in 1958. Performance of these tests has given us an opportunity, as never before, to evaluate the incidence and prevalence of biologic false positive reactors in Massachusetts.

## Basic Medical Data

Physicians and hospitals who request a TPI or RPCF test are asked to complete a form which summarizes the results of the diagnostic workup to date. The following information is requested.

### History

Is there a history of syphilis? If so, how much treatment has the patient received, in what year, and where?

Is there a history of any venereal disease?



populations of drug-resistant organisms, this seems to us to be an added reason for not using the agent.

We have discussed several disadvantages to the use of long-acting penicillin in acute gonorrhea in men. The disadvantages, while considerable, might be tolerated if the use of long-acting penicillin provided compensating advantages in the control of gonorrhea. In Houston we have not been able to show any influence on gonorrhea morbidity, or in long-term retreatment rates through the use of this agent in men. We have, therefore, discontinued its use in men coming to our clinic with gonorrhea.

We are continuing to give long-acting penicillin to women. Takos and co-workers have formulated an epidemiological rationale for such therapy based on the differences in the natural history of the disease in men and women (4). In the vast majority of women, gonorrhea is asymptomatic, or nearly so, and they do not usually seek treatment voluntarily. For these reasons, the objective of the therapeutic schedule followed by these researchers is to cure the patient of her Neisserian infection and at the same time protect her from reinfection for about 6 weeks. In addition, Garson and Barton have recently discussed theoretical therapeutic advantages of treating gonorrhea in women with long-acting penicillin (5).

The therapeutic schedule used by Takos and co-workers in men was founded upon three assumptions: (a) the promiscuously exposed male urethra is the most effective casefinding tool known, (b) when a man becomes infected, he will be symptomatic, and (c) his symptoms will cause him to seek medical attention. Takos' male patients were treated with enough short-acting penicillin to effect a rapid cure, but care was taken not to give long-acting penicillin, with its resultant several weeks of antibiotic quarantine. The cured but still promiscuous man is swiftly returned to risk in his high-gonorrhea-incidence social milieu. His active libido and minimal inhibitions are thus utilized again and again to locate additional asymptomatic but infected women.

## Summary

Four different penicillin schedules were used in the therapy of acute gonorrhea in 3,622 men at the venereal disease clinic, Houston, Tex. The objective was to determine what effect the use of benzathine penicillin might have on the gonorrhea control program in Houston.

Patients treated with a mixture of long- and short-acting penicillin showed lower retreatment rates for gonorrhea during the first 4 weeks of the followup period. This was presumably due to an antibiotic quarantine against reinfection, resulting from the prolonged action of the benzathine penicillin. In the next 12 weeks of the followup period, it was found that those patients treated with mixtures containing long-acting drugs returned with gonorrhea at a faster rate than did those treated originally with a single drug. At the termination of the full 16 weeks' followup period, there was no appreciable difference in the cumulative retreatment rate on any of the schedules.

No correlation could be shown between the use of any treatment schedule and changes in gonorrhea morbidity at our clinic in Houston.

No long-term advantage to gonorrhea control could be demonstrated through the use of benzathine penicillin in the therapy of acute gonorrhea in men.

Several disadvantages, both practical and theoretical, to the use of long-acting penicillin in men with acute gonorrhea are discussed.

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real diseases. If there are no conflicts in the test results, the reports are mailed to the referring physician or hospital.

As experience with these two tests was gained over the years, the policy was adopted of using the RPCF test as a screening device on patients with reactive blood Hinton tests. If the RPCF test was positive, the diagnosis of syphilis could be confirmed, but if this test was negative, a TPI test was advised. Whenever a TPI test was done, the RPCF test was also performed.

### Sensitivity and Specificity of Tests

The physician is concerned primarily with determining whether a patient with a positive blood Hinton test does or does not have syphilis. For this reason, he must know the limitations of the treponemal tests. These limitations can best be described by comparing the sensitivity of these tests in the various stages of untreated syphilis with the sensitivity of the older Hinton test.

The RPCF test is more sensitive than the TPI test in early syphilis, where we don't particularly need a high degree of sensitivity, and less sensitive in latent and late syphilis, where we do want and need a more sensitive test (fig. 1). Thus, in primary syphilis, while the Hinton test is positive in 70 percent of the cases, the RPCF test has a sensitivity of 65 percent, the TPI test only 50 percent. In secondary syphilis, the Hinton test is always positive, but the RPCF test is positive in only 98 percent of cases, and the TPI test in 95 percent. In latent syphilis, the Hinton test is of necessity positive in all cases. The TPI test is practically always positive, too, but the RPCF test is positive in only 95 percent of the cases. In late syphilis, the Hinton test is positive in 75 percent of the cases, the RPCF test in 85 percent, and the TPI in 98 percent.

Although absolute percentages have been given to depict the level of sensitivity of these tests in the various stages of untreated syphilis, these percentages indicate only the average range of sensitivity. Any or all tests may vary from their assigned sensitivities in a given case and in accordance with the test technique used. Thus, in patients with a syphilitic

chancre of 1 day's duration, the blood test will be positive in only about 25 percent. At the beginning of the second week after infection, approximately 50 percent of such patients become seropositive. The number increases to 75 percent at the beginning of the third week and to 100 percent by the fourth week, by which time most patients exhibit signs and symptoms of secondary syphilis. Similarly, a patient with late secondary syphilis has a greater chance of having positive RPCF and TPI tests than one in the early secondary stage. Results of the treponemal test may not show the same level of sensitivity when different techniques are used or when different laboratories perform these tests, even on the same blood sample.

**Table 1. Syphilitic infection in 703 patients with positive reactions to the Hinton test, Massachusetts, 1954-59**

Classification	Total reactors	Infected	
		Number	Percent
Total.....	703	548	78.0
Clinic or private:			
Clinic.....	548	451	82.3
White.....	332	243	73.2
Nonwhite.....	216	208	96.3
Private.....	155	97	62.6
White.....	146	88	60.3
Nonwhite.....	9	9	100.0
Race:			
White.....	478	331	69.2
Male.....	231	176	76.2
Female.....	247	155	62.8
Nonwhite.....	225	217	96.4
Male.....	79	74	93.7
Female.....	146	143	97.9
Sex:			
Male.....	310	250	80.6
Female.....	393	298	75.8
Marital status:			
Single.....	169	114	67.5
Male.....	91	68	74.7
Female.....	78	46	59.0
Married.....	365	283	77.5
Male.....	172	139	80.8
Female.....	193	144	74.6
Widowed.....	78	66	84.6
Male.....	22	19	86.4
Female.....	56	47	83.9
Separated.....	53	51	96.2
Male.....	16	15	93.8
Female.....	37	36	97.3
Divorced.....	38	31	89.5
Male.....	9	9	100.0
Female.....	29	25	86.2

### Physical Examination

Is there any evidence of primary, secondary, or late symptomatic syphilis or sequelae of these stages?

Are there any stigmata of congenital syphilis?

### Diseases and Immunizations Causing False Positive Reactions

Is there any evidence of a disease commonly causing a biologic false positive reaction? (A list is given on the form.)

### Epidemiological Investigation

Give the result of your examination, including the blood test for syphilis on the patient's spouse, parents, children, or siblings, as indicated.

### Laboratory Tests

Record the results of at least two blood tests for syphilis.

Give the date of the lumbar puncture and the result of your examination of the spinal fluid, including cell count, total protein, and serology.

One or more of the above requirements are waived for good and sufficient medical and social reasons. For example, the lumbar puncture is not required in a pregnant patient, a patient with a "bad back," a debilitated patient, or a patient who flatly refuses to have a lumbar puncture done. Examination of the marital partner or other epidemiological investigations are postponed when the patient asks that his

family not be tested at this time. No exceptions are made to the requirement that the results of at least two blood tests be reported.

On receipt of the completed summary from the physician or hospital, the division of venereal diseases makes an appointment with the State cooperating venereal disease clinic for the patient to have blood drawn for the TPI test because special techniques are required for this test. The clinic sends a split sample of the patient's serum to the Public Health Service Venereal Disease Research Laboratory at Chamblee, Ga., so that the same blood sample may be tested in two different laboratories. This procedure safeguards against laboratory errors, which are on the negative rather than on the positive side, and imparts greater reliability to the test results. From each blood sample taken for the TPI test, serum is saved for the RPCF test.

To each physician or hospital requesting only the RPCF test, the division of venereal diseases sends a laboratory slip which is to be completed and wrapped around a tube containing 8 cc. of clotted blood. This tube is to be mailed to the Wassermann laboratory.

All laboratories send reports of both the TPI and RPCF tests direct to the division of vene-

Figure 1. Sensitivity of reagin, RPCF, and TPI tests in untreated syphilis

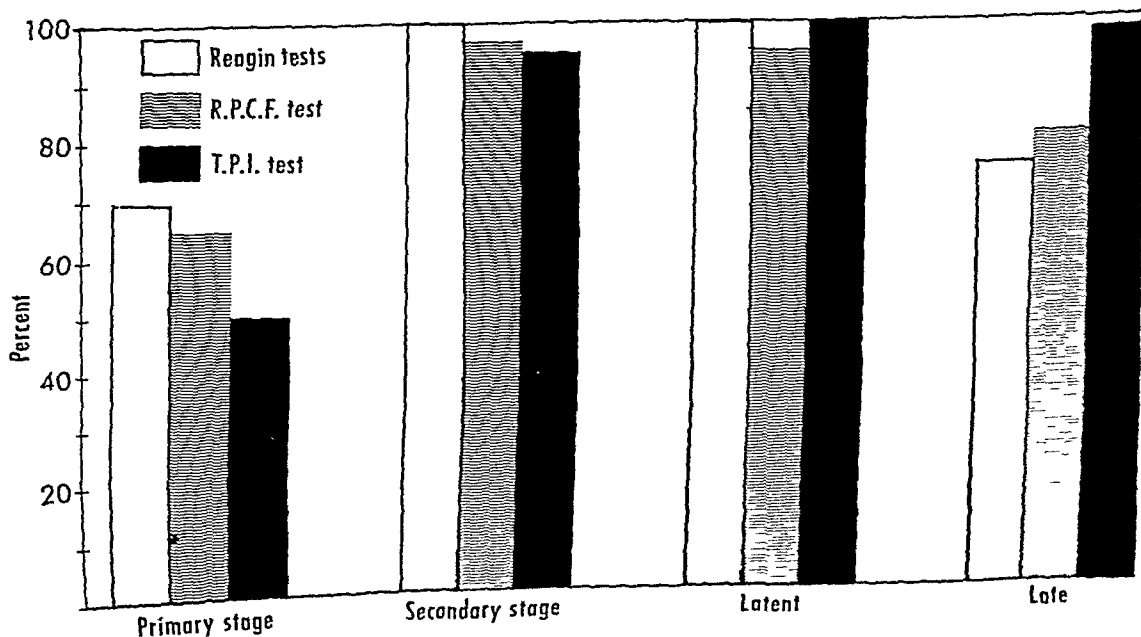
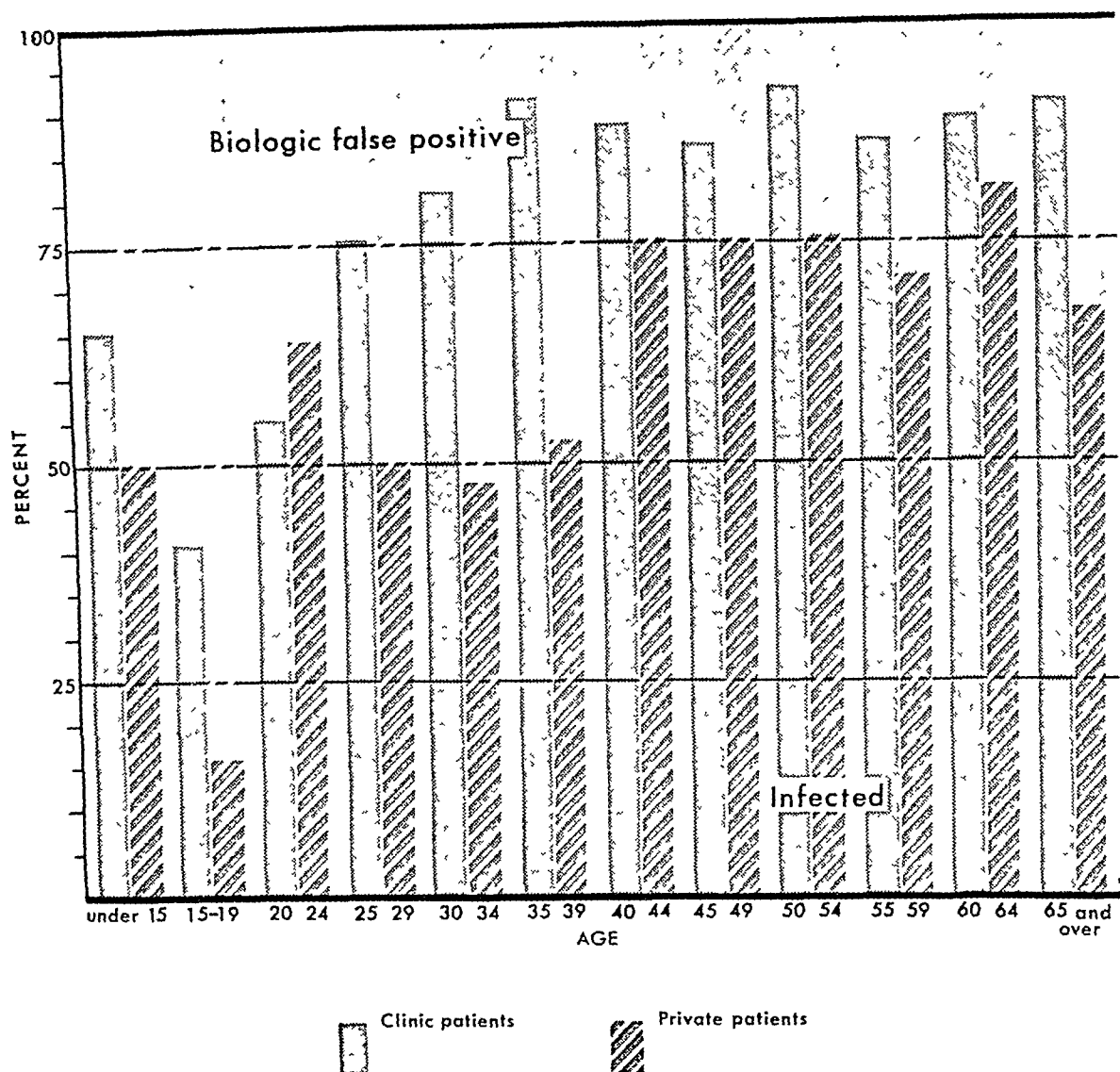


Figure 3. Results of treponemal tests of 703 clinic and private patients, by age, Massachusetts, 1954-59



percent) were widowed, 53 (7.5 percent) were separated, and 38 (5.4 percent) were divorced.

#### Infection Rates

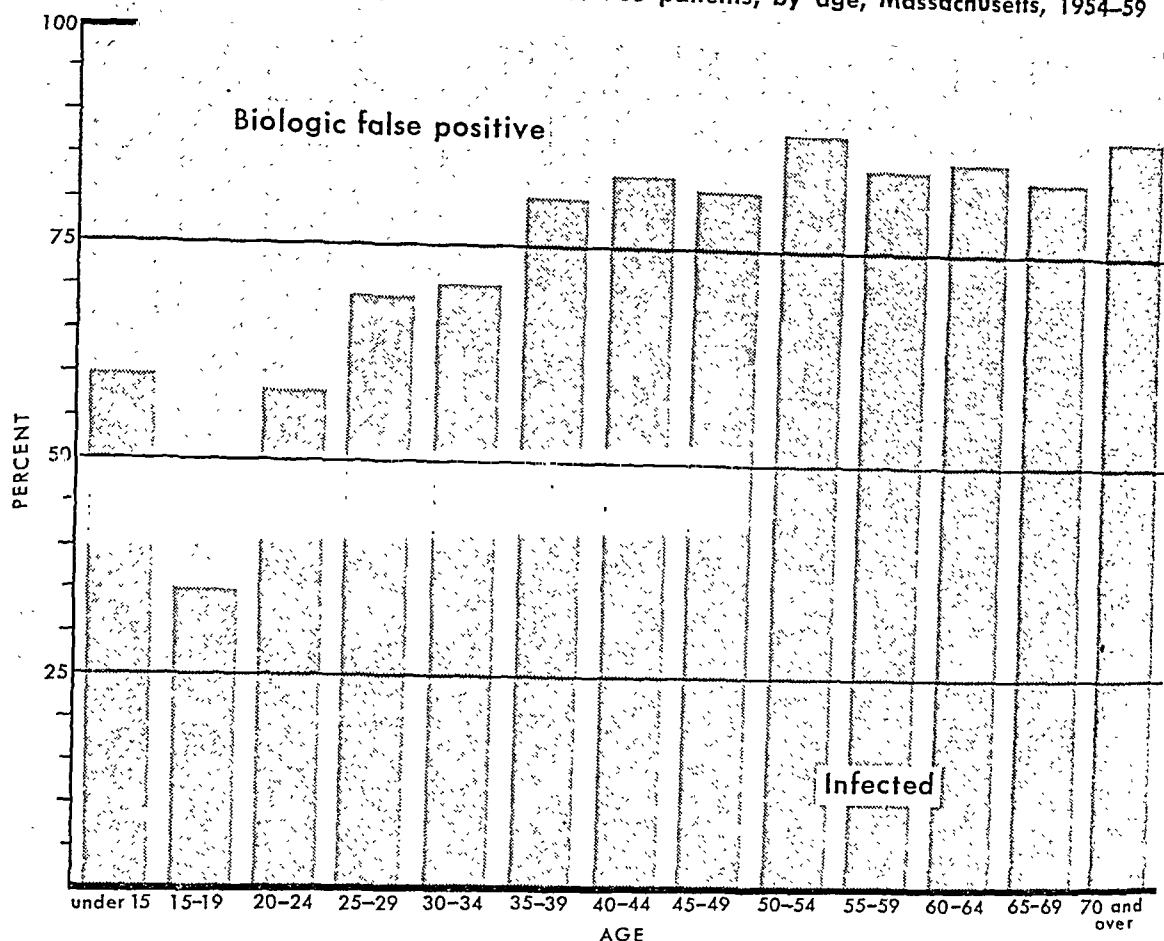
On the basis of a positive treponemal test, either the TPI or RPCF test, or both, 548 (78 percent) of the 703 patients were infected, whereas 155 (22 percent) were not infected, but had a biologic false positive reaction. The detailed data on infection are given in table 1.

Clinic patients were infected more frequently (82.3 percent) than private patients (63 per-

cent). Nonwhite patients had syphilis more often (96.4 percent) than white patients (69.2 percent) irrespective of whether they were clinic patients or patients of private physicians. Furthermore, the infection rate in nonwhites of both sexes was higher than in white persons. But the infection rate was about the same in males and females of the same race.

When the 703 patients were studied by 5-year age groups, an interesting pattern was seen. With the exception of the group aged 15-19 years, the infection rate increased with age up to about 45 years, when it tended to level

Figure 2. Results of treponemal tests of 703 patients, by age, Massachusetts, 1954-59



At the present stage of knowledge of and experience with the treponemal tests, a positive reaction, for all practical purposes, means syphilis or a treponemal disease, namely, yaws, pinta, or bejel.

#### Types of Cases Studied

This report covers an analysis of 703 positive Hinton reactors who, on the basis of the study forms submitted by their physicians had no historical, physical, or epidemiological evidence of syphilis. Excluded are (a) patients who had clinical evidence of syphilis but who had either positive or negative blood and spinal fluid serologic tests, (b) patients who had epidemiological evidence of syphilis but had negative clinical and serologic findings, (c) patients who had had not only a positive blood Hinton test but also positive spinal fluid serology (a positive spinal fluid serology means neurosyphilis)

and whose TPI or RPCF test was positive too, and (d) patients who had an initial positive qualitative Hinton test but whose later quantitative Hinton tests were negative on at least two occasions. Thus, the study group is composed entirely of patients with persistent positive blood Hinton tests whose physicians could not decide whether or not they had syphilis.

Of the 703 cases studied, 155 (22 percent) were patients of private physicians and 548 (78 percent) were from clinics and hospitals. There were 478 (68 percent) white patients and 225 (32 percent) nonwhite. There were 310 (44.1 percent) males, and of these, 231 (74.5 percent) were white and 79 (25.5 percent) nonwhite. Females numbered 393 (55.9 percent), and of these 247 (62.9 percent) were white and 146 (37.1 percent) nonwhite. As regards marital status, 169 patients (24 percent) were single, 365 (51.9 percent) were married, 78 (11.1

known high prevalence of syphilis also had a higher infection rate among their diagnostic problem cases.

When the data were analyzed according to individual referring hospitals, the infection rate among the 703 diagnostic problem cases generally reflected the prevalence of syphilis in the population group from which the patients came (table 3). In hospitals drawing their patients from areas with a high syphilis prevalence—Boston City Hospital and Massachusetts Memorial Hospital, for example—these diagnostic problem patients showed a

higher infection rate than patients in hospitals in areas of lower syphilis prevalence.

Lastly, an attempt was made to correlate the highest dilution positive Hinton test with the diagnosis of biologic false positive reactor. The highest dilution positive titer recorded was 1:16, and this in one case only (fig. 5). In general, BFP reactors have low titer serologic tests, although exceptions to this have been seen by almost all physicians. But among these 155 BFP reactors, only 1 patient had a positive Hinton test at a dilution of 1:16; none in more diluted serum.

**Table 2. Results of treponemal tests on 703 positive reactors to the Hinton test, by type of patient and community size, Massachusetts, 1954-59**

Community size	Cases		Type of patient											
			Private				Clinic				Total			
			Infected		BFP <sup>1</sup>		Infected		BFP <sup>1</sup>		Infected		BFP <sup>1</sup>	
	Number	Per cent	Number	Per cent	Number	Per cent	Number	Per cent	Number	Per cent	Number	Per cent	Number	Per cent
Boston <sup>2</sup> .....	400	57	31	69	14	31	309	87	46	13	340	85	60	15
100,000-149,999.....	7	1	2	40	3	60	1	50	1	50	3	43	4	57
50,000-99,999.....	124	18	28	72	11	28	62	73	23	27	90	73	34	27
All other.....	172	24	36	55	30	45	79	87	27	13	115	67	57	33
Total.....	703	100	97	63	58	37	451	82	97	18	548	78	155	22

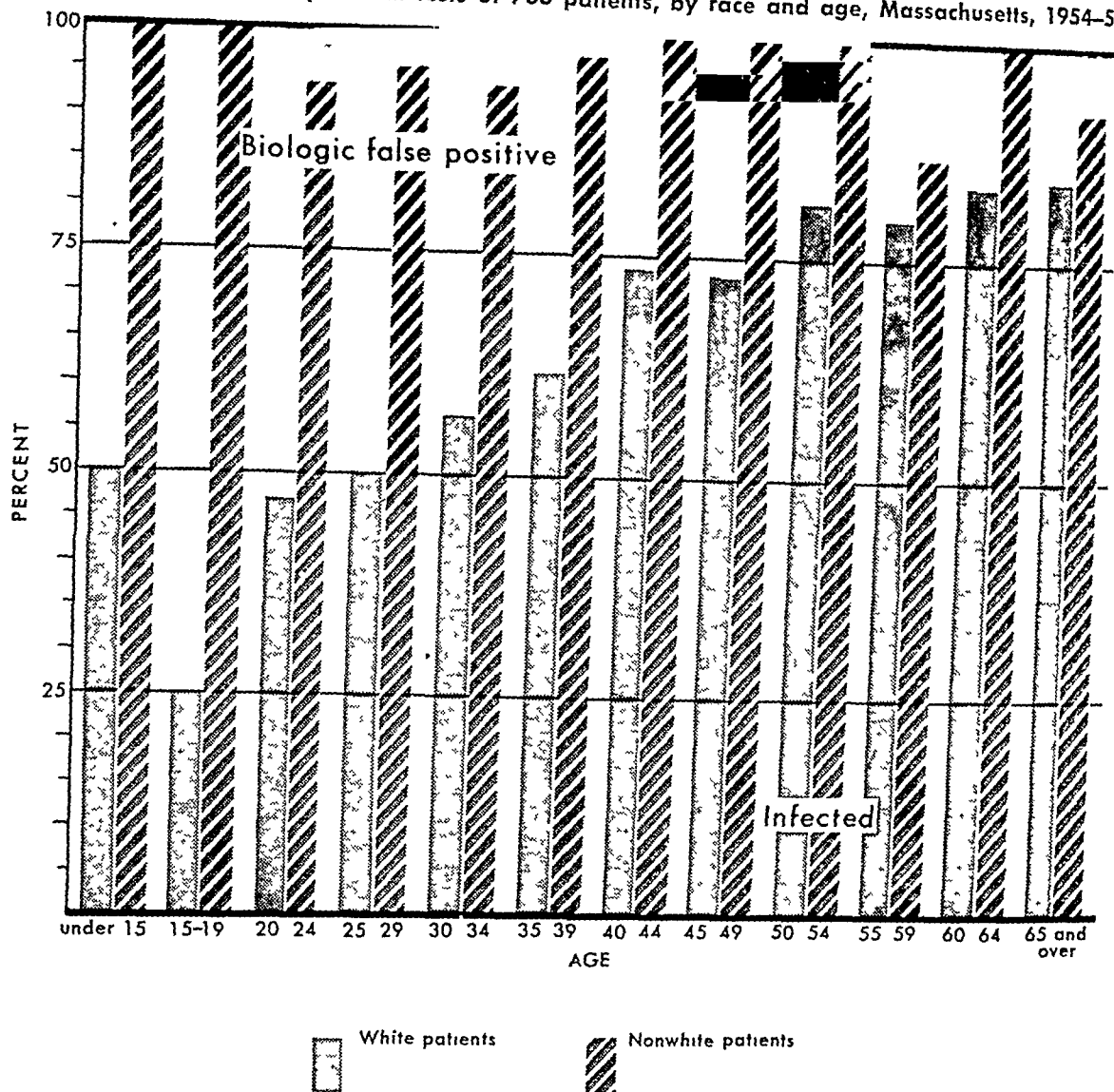
<sup>1</sup> Biologic false positive.

<sup>2</sup> Population 724,702.

**Table 3. Results of treponemal tests on 703 positive reactors to the Hinton test, by source of request, 1954-59**

Source of request	Total	Infected		Biologic false positive	
		Number	Percent	Number	Percent
Total.....	703	548	78.0	155	22.0
Voluntary hospitals.....	535	440	82.2	95	17.8
Beth Israel.....	14	9	64.3	5	35.7
Boston City.....	103	95	92.2	8	7.8
Boston Dispensary.....	24	18	75.0	6	25.0
Massachusetts General.....	188	148	78.7	40	21.3
Massachusetts Memorial.....	138	127	92.0	11	8.0
Peter Bent Brinham.....	26	17	65.4	9	34.6
All other.....	42	26	61.9	16	38.1
State hospitals.....	13	11	84.6	2	15.4
Private physician.....	155	97	63.0	58	37.0

Figure 4. Results of treponemal tests of 703 patients, by race and age, Massachusetts, 1954-59



off (fig. 2). This pattern was seen in both private and clinic patients (fig. 3) and in white patients (fig. 4), but nonwhite patients in this age group failed to show the sharp decrease in infection rate.

The infection rate in both males and females followed the general trend of increasing infection with age, but with a sharp increase in the BFP rate in the 15- to 19-year age group. White males, and to a greater extent, white females, showed this sharp increase in BFP rate in the 15- to 19-year age group, but the infection rate in neither the nonwhite males nor the nonwhite females followed this pattern.

In general, the rate of infection was highest in the larger cities, particularly among patients of private physicians, and to a lesser extent, among clinic patients (table 2). The general policy of the State department of public health is that no patient be "closed out" as a biologic false positive reactor without the benefit of a treponemal test, even though the diagnosis is obvious.

Boston, the largest city in the State, had the highest infection rate (85 percent). Among census tract districts, the infection rate varied from a high of 100 percent to a low of 50 percent. Many of the districts with a

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## Training Courses

**Mobilization.** Four courses to train medical and health personnel in emergency civil defense services are scheduled for fiscal year 1961 by the Public Health Service and the Office of Civil and Defense Mobilization. Three of them, offered for the first time, are for hospital administrators, registered nurses, and environmental health personnel. The fourth repeats basic health mobilization training for physicians and health-related professions given in the spring of 1960. All courses cover basic civil defense concepts, current information on biological, chemical, and radiological warfare, and community disaster planning. Tuition and housing are without cost to students and about half of necessary travel expenses are reimbursable through OCDM student training funds. Enrollments are limited. Apply through State civil defense directors. The courses are:

*Health Mobilization Program for Emergency Hospital Management.* OCDM Eastern Instructor Training Center, Brooklyn, N.Y., December 4-9, 1960. (Professional endorsement of the American Hospital Association.)

*Nursing Aspects of Health Mobilization.* OCDM Staff College, Battle Creek, Mich., April 23-28, 1961.

*Environmental Health Aspects of Health Mobilization.* Battle Creek, Mich., April 23-28, 1961.

*Health Services Aspects of Health Mobilization.* OCDM Eastern Instructor Training Center, Brooklyn, N.Y., May 7-12, 1961.

**Sanitary Engineering.** Training courses scheduled by the Robert A. Taft Sanitary Engineering Center include a course on medical and biological aspects of air pollution for physicians, veterinarians, and control officials dealing with health-related hazards, and another on determining antibiotic and pesticide residues in milk for professional people in regulatory and control agencies and in industry.

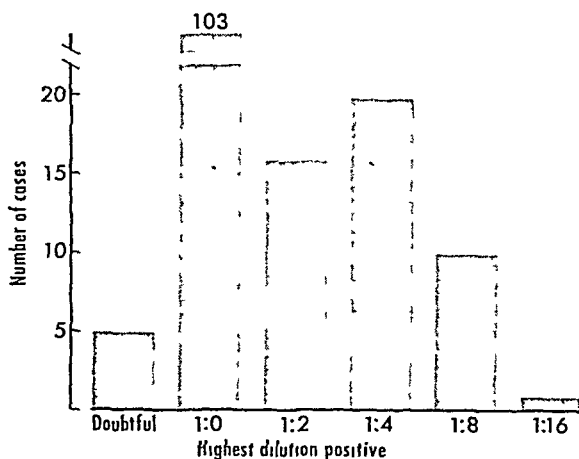
*Medical and Biological Aspects of Air Pollution.* Primarily treats health aspects of air pollution as observed in recorded incidents and explored through laboratory and epidemiological investigations. Also outlines concepts of an engineering program for supplementing assessment of a community's air pollution problem. December 12-16, 1960.

*Determination of Antibiotic and Pesticide Residues in Milk.* Detection techniques and procedures, including sessions for exchange of problems encountered by responsible officials. December 12-16, 1960.

Direct requests for more information and applications to the Chief, Training Program, Robert A. Taft Sanitary Engineering Center, 4676 Columbia Parkway, Cincinnati 26, Ohio, or to a Public Health Service regional office director.



**Figure 5. Highest dilution Hinton positive tests among 155 biologic false positive reactors, Massachusetts, 1954-59**



### Summary

The division of venereal diseases of the Massachusetts Department of Public Health made a study of 703 patients who had persistently positive blood Hinton tests and who had no historical, physical, or epidemiological evidence of syphilis, on the basis of protocols submitted by their physicians. Each of these patients represented a diagnostic problem to the private or clinic physician, and a treponemal test was indicated.

When the *Treponemal pallidum* immobilization (TPI) and the Reiter protein complement fixation (RPCF) tests were positive, the diagnosis of syphilis could be confirmed. When an RPCF test was negative, the physician was advised to have his patient have a TPI test. If both tests were negative, the patient could be classified as a biologic false positive (BFP) reactor, with a few reservations. The sensitivities of the TPI and the RPCF tests were compared with the sensitivity of the Hinton tests in the various stages of untreated syphilis.

On the basis of all available data, including the treponemal tests, 548, or 78 percent, of the 703 diagnostic problem patients were found to be infected, and 155 (22 percent) were BFP reactors. Approximately 70 percent of the white and 96 percent of the nonwhite patients had syphilis. The infection rate was about 82 percent in clinic patients and 63 percent in private patients. More cases of syphilis were discovered in both men and women who were

married or who had been married than in single persons.

In these diagnostic problem cases, with the exception of white patients aged 15 to 19 years, the number of cases of syphilis discovered increased up to age 45, when the infection rate tended to level off. Of practical interest was the sharp increase in BFP reactions in white patients in the age group 15-19 years.

More syphilis was found in the larger cities, and the highest rate was in Boston, the largest city in the study area. Areas in Boston and elsewhere in the State which have a higher syphilis prevalence also showed a higher infection rate among these diagnostic problem cases. This was reflected in the number of syphilis cases in the hospitals drawing their patients from these areas.

When the 155 patients with BFP reactions were studied to correlate their highest dilution serologic titers with their diagnoses, it was found that only one had a positive dilution titer of 1:16; all others had lower positive titers. This coincides with the experience of physicians that, generally speaking, patients with BFP reactions have low-titer serologic titers. Many exceptions can be found, however.

Results of this study indicate strongly that the reagin tests are still valuable in the diagnosis of syphilis. Even when diagnostic problems arise, almost 80 percent of patients with a persistently positive blood reagin test have or have had syphilis. For this reason, such patients must be considered to be syphilitic until proved otherwise. Today, a diagnosis of BFP should not be made in Massachusetts without the benefit of the RPCF test as a screening device, and if this test is negative, the TPI test should be performed. Only when both treponemal tests are negative can the diagnosis of biologic false positive reaction be entertained in a patient with a persistently positive reagin blood test.

### REFERENCES

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For the purposes of this comparison, all persons positive to the retest procedure, that is, showing over 140 mg. on the 2-hour blood sugar determination, were arbitrarily designated as diabetics. In almost all cases, these designations were confirmed by further evaluation. Persons who were positive on the screening test but negative on the retest were designated as false positives in this study.

The three testing levels were not employed concurrently, but consecutively. The 180 mg. level was used between October 1956 and March 1957; the 160 mg. level, between April 1957 and December 1957; and the 130 mg. level, between January 1958 and May 1959. The specific periods are indicated because from time to time we have suspected that the season of the year influenced screening results, although we do not have confirmatory evidence of this.

### Characteristics of Study Group

The yield of a detection program is influenced greatly by the characteristics of the population group under study and the extent of unrecognized diabetes. Table 1 indicates the distribution of persons tested, by age, sex, and color. Women constituted approximately four-fifths of the total group, and approximately two-thirds of the total were nonwhite women. Approximately 70 percent of the total group were between the ages of 30 and 50 years, and more than 90 percent were between 30 and 60 years of age. Although the age, race, and sex dis-

**Table 1. Distribution of persons tested for diabetes, by age, sex, and color, City of Memphis Hospitals, 1956-59**

Age group (years)	Total	White		Nonwhite	
		Male	Female	Male	Female
Total.....	7, 294	500	1, 293	703	4, 798
Under 30.....	47	3	13	5	26
30-39.....	2, 778	183	482	231	1, 882
40-49.....	2, 358	163	411	190	1, 594
50-59.....	1, 489	107	268	138	976
60-69.....	452	35	91	84	242
70-79.....	131	8	25	40	58
80 and over.....	29	1	0	12	16
Unknown.....	10	0	3	3	4

**Table 2. Time of diabetes test in relation to last meal, City of Memphis Hospitals, 1956-59**

Time since eating (hours)	Persons tested	Percent of total
Total.....	7, 294	100. 0
Less than 1.....	775	10. 6
1 to 2.....	1, 518	20. 8
2 to 3.....	1, 663	22. 8
3 or more or fasting.....	3, 325	45. 6
Unknown.....	13	. 2

tribution of populations tested at each of the three screening levels was generally similar, the proportion of nonwhite women under 40 years of age was higher in the group screened at 180 mg. than in the groups screened at either 130 mg. or 160 mg. This relatively large group of young nonwhite women probably has exerted a small downward influence on the yield of new diabetes cases at the 180 mg. testing level.

Table 2 indicates the time of testing in relation to the last food intake. Since persons applied for tests throughout the day, no control could be exerted over the time interval between testing and the last food eaten. No attempt was made to adjust the screening level in relation to the time of last food intake. Thus this study provided an opportunity for comparing the yields of new diabetes cases from testing done at random intervals after eating when a single testing level was employed. The high proportion of our study group (45.6 percent) tested while in a fasting state should be noted, since fasting blood specimens are generally considered undesirable for such testing (2), and our yield of new cases has undoubtedly been influenced by this factor. However, because the distribution of persons tested by time since eating was essentially the same at each screening level, this factor did not affect the comparability of results at the three levels.

### Analysis of Results

New diabetes cases found as the result of all tests performed during the study period are shown, by age group, in table 3. Of all persons tested (7,294), 1.6 percent were found to have

# Screening for Diabetes With the Clinitron

HENRY PACKER, M.D., Dr.P.H., R. F. ACKERMAN, M.D., and JEAN M. HAWKES, M.D.

**D**URING THE PERIOD October 1, 1956, to May 15, 1959, the Hewson clinitron was employed in a diabetes detection program which tested 7,294 persons coming to the outpatient department of the City of Memphis Hospitals for health card examinations. Most of these persons were referred by employment agencies, public welfare agencies, and employers. Testing for diabetes was performed as part of a multiple screening program which also included tests for syphilis, tuberculosis, uterine cancer, and glaucoma. Urine as well as blood was examined in the preliminary screening tests for diabetes in order that the relative sensitivity and specificity of both test methods could be compared in a separate report.

The present report is concerned only with a comparison of results obtained with use of the clinitron for screening at the preselected levels of 180 mg. percent, 160 mg. percent, and 130 mg. percent, using fingertip blood. Information concerning the Wilkerson-Heftmann method of blood sugar determination (1) and the operation of the clinitron (2) can be found in the literature and will not be detailed here. Suffice it to say that this instrument can complete as many as 120 tests per hour when it is operated at capacity, indicating, in less than 6

minutes per individual test, whether a specimen contains enough true glucose to exceed the preselected screening level. The solution in which the blood and reagent tablets are placed turns blue when the test is negative and becomes colorless when it is positive. Reagent tablets required for the clinitron are available commercially, and the cost of the four tablets required for each test is approximately 5 cents.

The clinitron is an expensive piece of equipment which lends itself mainly to mass testing programs. For testing on a smaller scale, using the same tablets and technique, a less expensive instrument (the Glover-Edwards Glucose Test Kit) is available. The present study was undertaken to evaluate the relative yield of true and false positives at the three testing levels which can be used with the clinitron. An evaluation of the instrument for small-scale testing is now in progress.

## Procedure

Fingertip blood was drawn from all persons applying for a health card. The amount drawn was either 0.1 or 0.1125 ml., depending on the testing level employed at the time of the examination. Persons showing a positive test were called back for retesting with a modified glucose tolerance test in which two blood sugar determinations, one fasting and the other 2 hours after the administration of 100 grams of glucose, were obtained. Persons showing over 140 mg. (Folin-Wu method) on the 2-hour blood sugar were referred to the City of Memphis Hospitals' medicine clinic for definitive evaluation for diabetes, unless they were ineligible for evaluation by the clinic. The few who were ineligible were referred to private physicians.

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*The authors are with the University of Tennessee College of Medicine in Memphis. Dr. Packer is professor, and Dr. Ackerman is assistant professor, in the division of preventive medicine. Dr. Hawkes is associate professor in the division of medicine. Robert M. Thorner of the Chronic Disease Branch, Bureau of State Services, Public Health Service, and Miss Nina V. Fisher of the Service's Atlanta Regional Office assisted in the analysis of statistical data. Research was supported in part by funds from the Chronic Disease Branch.*

**Table 5. Screening level in relation to new diabetes cases and false positives, City of Memphis Hospitals, 1956-59**

Screening level (mg./100 ml.)	Persons tested	New diabetes cases		False positives		
		Number	Percent of total tested	Number	Percent of total tested	Percent of total screening positive
130.....	3, 315	81	2.4	66	2.0	38.4
160.....	2, 483	26	1.1	4	0.2	13.3
180.....	1, 496	8	0.5	2	0.1	16.7

mg. was not statistically significant, but the yield of new cases using the 130 mg. level was significantly greater ( $P=.05$ ) than when the higher screening levels were employed.

Table 5 also indicates the false positive results occurring at each of the testing levels in relation to all persons tested and to all persons screening positive. The retest load at each screening level is thereby delineated. Thus, when the 130 mg. level was used, it was necessary to identify as nondiabetic by retest 2 persons out of every 100 originally screened in order to obtain the yield of 2.4 percent new diabetics. Expressed the other way, approximately 38 persons out of each 100 who screened positive at this level and were therefore retested were found to be nondiabetic. At the other extreme, when the 180 mg. level was employed, only about 1 person per 1,000 screened was falsely reported as positive, and only 17 persons out of each 100 screening positive turned out to be nondiabetic. However, the yield of new cases of diabetes was low at 180 mg., being approximately one-fifth as great (0.5 percent) as that observed when the 130 mg. level was used (2.4 percent).

## Discussion

In conducting a diabetes screening program, primary consideration must be given to factors which increase the yield of previously unrecognized cases and also to factors which increase the need for retesting in order to identify prop-

erly those persons who screen positive but do not have diabetes. Although optimum performance, in terms of maximizing the former and minimizing the latter, is a desirable objective, administrative considerations may occasionally necessitate a compromise which falls short of achieving such optimum results. For example, in one situation an unlimited load of retesting can be undertaken, thereby making it possible to achieve a high yield of new cases discovered. Testing with the clinitron at the 130 mg. level would be appropriate under these conditions. In the light of our findings and in view of our circumstances, we shall employ this level of testing in our health card program in the future. Others (3,4) have also found that this level produces optimum casefinding results.

Under different circumstances, the volume of retesting required by use of the 130 mg. level with the clinitron may be unacceptable. For example, we have encountered the resentment of some patients who were screened in other programs and who incurred considerable expense when they were referred to private physicians because of what turned out to be false positive screening tests. Physicians as well as patients tend to lose confidence in a detection program which necessitates reassuring many persons through further study that diabetes is not present in spite of a positive screening test. We have been able to obviate this factor to some extent by performing modified glucose tolerance tests on persons screening positive before referring them to private physicians. To minimize this factor in some programs, it may be necessary to use a higher screening level, such as 160 mg. or 180 mg., even at a sacrifice of yield.

Some of the factors affecting the performance of a diabetes screening program may be beyond administrative control. The total prevalence of diabetes, the prevalence of the component of unrecognized diabetes, and the age, color, and sex distribution of the population studied are factors of this nature. Factors which lend themselves to administrative control are selection of age groups for testing and selection of testing levels when the clinitron is used. Selection of the time interval between eating and testing may or may not be subject to control.

**Table 3. Yield of new diabetes cases, by age, City of Memphis Hospitals, 1956-59**

Age group (years)	Persons tested	New diabetes cases	
		Number	Percent of total
Total.....	7, 294	115	1. 6
Under 30.....	47	0	0
30-39.....	2, 778	16	0. 6
40-49.....	2, 358	32	1. 4
50-59.....	1, 489	38	2. 6
60-69.....	452	24	5. 3
70 and over.....	131	5	3. 8

previously unrecognized diabetes. The percentage of new cases increased with increasing age up to 70 years, and ranged from 0.6 in the 30- to 39-year group to 5.3 in the 60- to 69-year group.

To examine the relative prevalence in the different race and sex groups, age-specific rates were calculated, based on the total known and new diabetics and adjusted to the age distribution of all persons tested. The age-adjusted rates are as follows:

Race and sex	Rate per 100
All.....	4. 3
White male.....	2. 7
White female.....	2. 2
Nonwhite male.....	3. 1
Nonwhite female.....	5. 3

While these rates are based on small numbers in several age brackets, they follow the same pattern of higher diabetes mortality rates shown

in national statistics for nonwhites compared with whites. The higher rate indicated above for nonwhite women than for nonwhite men also bears out the male-female relationship in national mortality data. This relationship does not hold for whites in our survey; however, only 500 white men were tested.

Table 4 shows the influence of the time interval between testing and the last food intake on new diabetes cases found and on false positive results. Tests performed on persons in a fasting state showed the lowest yield (1.1 percent) of new cases, whereas the highest yield (2.7 percent) was observed in tests performed between 1 and 2 hours after eating. Of total persons screening positive, those tested between 1 and 2 hours after eating also produced the lowest percentage (28.1) of false positives. The highest percentage (53.3) of positive screening results subsequently identified as false positive occurred in tests performed within 1 hour after eating. The same patterns of yield and false positives in relation to these intervals between food intake and testing were observed in the results obtained at all three screening levels.

One of the main objectives of this study was to compare the relative yields of true and false positives at the three screening levels employed with the clinitron. Our results are summarized in table 5. Screening at the 130 mg. level yielded a higher return (2.4 percent new cases) than when screening was done at the 160 mg. level (1.1 percent new cases) or at the 180 mg. level (0.5 percent new cases). The difference between the results of screening at 160 and 180

**Table 4. Time of test after eating in relation to yield of new diabetes cases and false positives, City of Memphis Hospitals, 1956-59**

Time since eating (hours)	Persons tested	New diabetes cases		False positives		
		Number	Percent of total tested	Number	Percent of total tested	Percent of total screening positive
Less than 1.....	775	14	1. 8	16	2. 1	53. 3
1 to 2.....	1, 518	41	2. 7	16	1. 0	28. 1
2 to 3.....	1, 663	23	1. 7	19	1. 1	15. 2
3 or more or fasting.....	3, 325	37	1. 1	21	0. 6	36. 2
Unknown.....	13	0	0	0	0	0

# 1959 Summary of Disease Outbreaks

CARL C. DAUER, M.D., and DONALD J. DAVIDS

THE NUMBER of reported outbreaks of waterborne and foodborne diseases was slightly higher in 1959 than in 1958 (table 1). There was a considerable increase in number of reported outbreaks and cases of staphylococcal food poisoning as compared with the previous year, but this was largely offset by smaller numbers in some other categories (table 2).

While it seems improbable that outbreaks of foodborne diseases were more completely reported in 1959 than in previous years, there is evidence that more extensive laboratory investigations were being carried out in some areas.

The number of outbreaks in which phage typing of staphylococci was done increased in 1959. In a few instances, the same phage type of organism was recovered from specimens of food as from persons who were handling or preparing foods. Phage types 7 and 47 were more commonly reported than any others. Phage type 80/81 was recovered from ham in one outbreak and from milk in another. A few reports indicated that phage typing was being done but the results of tests were not received.

Introduction of coagulase-positive strains of staphylococci of human origin into herds of dairy cattle is receiving more attention. In one State antibiotic-resistant strains of phage type 80/81 were recovered from superficial lesions on the udders of cattle in a herd owned by a carrier of this type of staphylococcus. Two other adults in the family also were carriers of this type. When the animals were moved to new premises and their human contacts

changed, their lesions disappeared. A similar situation was reported recently by Wallace (1). Phage type 80/81 was recovered from four cattle in a dairy herd and also from lesions on one worker at the dairy farm. One State is now conducting an intensive study of staphylococcal infections in cattle and their relationship to human infections and disease.

Several outbreaks of foodborne diseases were reported in 1959 in which *Clostridium perfringens* (*welchii*) was considered or suspected as the etiological agent. This spore-forming organism, of which one type (A) causes gas gangrene, has been recognized as the etiological agent in outbreaks in England for a number of years. Its association with disease outbreaks in the United States had been suspected but was not proved until recently. Failure to recognize the role of this organism in foodborne diseases in this country has been due partly to the fact that it can be recovered only when incubated anaerobically. The procedures required for identification of the organism are complicated, and few laboratories are equipped to perform them. *C. perfringens* is widely distributed in nature in feces, sewage, and soil. Outbreaks due to this bacterium are usually associated with meat, including fowl, that has been cooked and allowed to cool slowly at room temperature. The incubation period of illnesses is about 8 to 12 hours but may be as long as 22 hours. According to Dack (2), the characteristic symptoms are acute abdominal pain and diarrhea, usually of short duration.

In 1959, there were 75 outbreaks of foodborne diseases, affecting more than 1,200 persons, in which poultry or other meat was thought to be the vehicle of infection but no etiological agent was identified. Possibly some of these were caused by *C. perfringens*. It has

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We have not been able to control this factor in our program.

It should also be recognized that fingertip blood is capillary blood which is practically arterial blood. Arterial blood shows much higher sugar readings after food than venous blood. Screening results employing fingertip blood would therefore be expected to be more sensitive at 1 and 2 hours after eating. In the fasting state venous and capillary blood have similar amounts of sugar, and the differences in sensitivity between fasting and 3-hour specimens would be negligible. These factors should be taken into consideration when venous blood is employed with the clinitron instead of fingertip blood as in our study.

### Summary

Seven thousand two hundred and ninety-four persons applying for health cards were screened for diabetes, using testing levels of 130 mg., 160 mg., and 180 mg. with the clinitron, during consecutive periods of time. Retests with a modified glucose tolerance test were performed on all persons screening positive.

The percentage of persons tested who were found to have previously unrecognized diabetes ranged from 0.6 in the 30- to 39-year age group to 5.3 in the 60- to 69-year group. Age-adjusted rates based on the total number of known and new diabetics revealed higher rates in non-whites than in whites, with nonwhite women showing the highest rate of any group (5.3 percent).

The highest yield of new diabetes cases (2.7 percent) was observed when testing was done between 1 and 2 hours after eating. Tests performed during this interval after eating also produced the lowest percentage of false positives in relation to total positive screening results.

The percentage of new cases found when the 130 mg. level was employed (2.4) was significantly higher than when higher screening levels were used. However, a significantly higher retesting load was encountered with use of the 130 mg. level than when the other levels were employed.

Selection of the appropriate screening level for use with the clinitron in a diabetes detection program hinges, in each case, on individual circumstances, of which the feasibility of retesting is an important example.

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### Correction

In the Statement on Oral Poliovirus Vaccine in the October issue of *Public Health Reports*, p. 871, last column, last two lines, the name of the chairman of the Public Health Service Committee on Live Poliovirus Vaccine should be Roderick Murray, M.D.

Table 2. Foodborne, waterborne, and other disease outbreaks reported in 1959, by type of infection

Area	Typhoid fever		Salmonellosis		Shigellosis		Trichinosis		Botulism		Staphylococcal food poisoning <sup>1</sup>		Gastroenteritis, etiology unknown <sup>1</sup>		Toxic agents		Other	
	Outbreaks	Cases	Outbreaks	Cases	Outbreaks	Cases	Outbreaks	Cases	Outbreaks	Cases	Outbreaks	Cases	Outbreaks	Cases	Outbreaks	Cases	Outbreaks	Cases
Total.....	5	43	19	1,428	6	228	6	38	10	24	89	4,138	182	4,285	14	74	9	592
New England:																		
Maine.....			3	11							2	6	3	292				
New Hampshire.....	1	14									2	10						
Vermont.....													1	40				
Massachusetts.....											2	143	4	199				
Rhode Island.....											1	17	1	13				
Connecticut.....							1	7					1	39				
Middle Atlantic:																		
New York.....	1	4					2	17			7	434	16	734	1	2	<sup>2</sup> 1	36
New Jersey.....															1	23		
Pennsylvania.....					1	21	1	4			1	36						
East North Central:																		
Ohio.....			1	374							6	943	6	166	1	16	<sup>3</sup> 1	3
Indiana.....											2	1,333						
Illinois.....			2	57							3	22	10	426				
Michigan.....									1	4							<sup>4</sup> 1	160
Wisconsin.....											4	125						
West North Central:																		
Minnesota.....											4	22	1	425				
Iowa.....											1	68						
Missouri.....					1	22												
Kansas.....																	<sup>5</sup> 1	5
South Atlantic:																		
Maryland.....											1	57						
District of Columbia.....													1	103			<sup>3</sup> 1	198
Virginia.....	1	9			1	100					1	72	1	25				
West Virginia.....											3	14	2	13				
North Carolina.....											1	36						
Georgia.....			1	14	1	30											<sup>3</sup> 1	3
Florida.....													1	155				
East South Central:																		
Kentucky.....											2	27						
Tennessee.....													1	261				
Alabama.....											1	134	1	156				
Mississippi.....											1	16	1	3			<sup>6</sup> 1	5
West South Central:																		
Arkansas.....							1	2										
Texas.....			1	400							1	85	1	40				
Mountain:																		
Idaho.....									1	6			1	12				
Wyoming.....											1	91						
Colorado.....			1	130					2	2	1	2					<sup>7</sup> 1	161
New Mexico.....	1	12									1	9						
Arizona.....			1	35														
Pacific:																		
Washington.....	1	4							1	2	1	4	42	186				
Oregon.....					1	7					4	37	2	64	2	7		
California.....			8	322	1	48			3	3	33	359	85	933	9	26	<sup>3</sup> 1	21
Noncontiguous:																		
Alaska.....									2	7								
Hawaii.....			1	85			1	8			1	20						
Puerto Rico.....											1	16						
United States, 1958.....	1	30	27	1,013	3	392	7	68	3	4	62	2,291	134	6,216	14	169		
United States, 1957.....	4	70	30	1,607	11	754	1	14	6	12	58	1,660	135	6,065	8	68		

<sup>1</sup> Includes outbreaks among military personnel infections. <sup>4</sup> Infectious hepatitis. <sup>5</sup> Brucellosis.

<sup>2</sup> Streptococcal infections. <sup>3</sup> *Clostridium perfringens*. <sup>6</sup> Amebiasis. <sup>7</sup> *Bacillus cereus* infections.



been suggested that when specimens of food, especially meat dishes, are examined bacteriologically, provision should be made for culturing them anaerobically if the common pathogens associated with food poisoning or infections are not readily isolated in substantial numbers. Anaerobic culturing is especially important when abdominal pain and diarrhea are predominant symptoms following an incubation period of about 10 to 12 hours.

Another spore-forming organism, *Bacillus cereus*, was presumably associated with an outbreak in 1959 for the first time in the United States. This organism has been implicated in several outbreaks in Scandinavian countries during the past decade. Since it is widely distributed in soil, dust, milk, and on plant surfaces, it may possibly be a more frequent etiological agent in foodborne disease than is generally recognized. However, further study is required to assess its importance in such illnesses.

These experiences indicate the importance of laboratory procedures in the investigation of foodborne disease. When these procedures are combined with more complete epidemiological investigation and more complete reporting of outbreaks, the foundation will be laid for reducing appreciably the amount of these illnesses. Estimating the amount for the country as a whole on the basis of reports from one or two States that appear to have reasonably complete reporting, there would be at least 1 million cases annually instead of the present 10,000.

### Waterborne Outbreaks

Seven reports of waterborne outbreaks were received during 1959. These consisted of three reports of typhoid fever and one each of amebiasis, hepatitis, chemical poisoning, and an outbreak in which *Escherichia coli* and enterococci were isolated from the water source.

One of the outbreaks of typhoid fever was traced to a small city's public water supply obtained from a creek, which was contaminated by a typhoid carrier who lived upstream. Slow sand filtration was the only treatment given the community's water. Prior to onset of the outbreak, the filters were being cleaned and their efficiency was reduced for a few days. A heavy rain flooded the creek, and for several days the

**Table 1. Foodborne and waterborne disease outbreaks reported in 1959, by vehicle of infection**

Area	Water		Milk and milk products		Other foods <sup>1</sup>	
	Outbreaks	Cases	Outbreaks	Cases	Outbreaks	Cases
Total.....	7	206	11	49	322	10,595
New England:						
Maine.....			1	3	7	306
New Hampshire.....	1	14			2	10
Vermont.....					1	40
Massachusetts.....					6	342
Rhode Island.....					2	30
Connecticut.....					2	46
Middle Atlantic:						
New York.....	1	4	1	3	26	1,220
New Jersey.....					1	23
Pennsylvania.....					3	61
East North Central:						
Ohio.....			1	3	14	1,499
Indiana.....					2	1,333
Illinois.....	1	11			14	491
Michigan.....	1	160			1	4
Wisconsin.....			1	3	3	122
West North Central:						
Minnesota.....					5	447
Iowa.....					1	68
Missouri.....					1	22
Kansas.....			1	5		
South Atlantic:						
Maryland.....					1	57
Dist. of Columbia.....					2	301
Virginia.....	1	9			3	197
West Virginia.....					5	27
North Carolina.....					1	36
Georgia.....			1	14	2	33
Florida.....					1	155
East South Central:						
Kentucky.....					2	27
Tennessee.....					1	261
Alabama.....					2	290
Mississippi.....	1	5			2	19
West South Central:						
Arkansas.....					1	2
Texas.....					3	525
Mountain:						
Idaho.....					2	18
Wyoming.....					1	91
Colorado.....					5	295
New Mexico.....					2	21
Arizona.....					1	35
Pacific:						
Washington.....			3	11	42	185
Oregon.....					9	115
California.....	1	3	2	7	137	1,702
Noncontiguous:						
Alaska.....					2	7
Hawaii.....					3	113
Puerto Rico.....					1	16
United States, 1958.....	4	445	13	441	236	9,925
United States, 1957.....	4	131	8	67	250	11,085

<sup>1</sup> Includes outbreaks among military personnel.

although food was suspected in two. Two of the outbreaks occurred among school children; one was a community outbreak thought to be due to poor sanitation, and the other three occurred in a youth guidance group, in a day nursery, and among children attending a school party. *Shigella sonnei* was recovered from patients in five of the outbreaks. The organism isolated from children attending the school party was *Shigella flexneri*.

Another report, not included in our tabulations, stated that an unusual number of *S. sonnei* infections occurred during the last half of 1959 in an eastern city. Cases were distributed equally among white and nonwhite persons living in a low socioeconomic area. The majority of the nonwhite patients were children under 10 years of age, whereas the white patients were older. Many possible chains of transmission were noted.

#### Trichinosis

The meats involved in the six outbreaks of trichinosis were raw pork, raw ground lamb, cooked pork, a spiced bacon roll resembling salami, rare hamburger, and smoked sausage. In the last outbreak, various types of pork were eaten, but the smoked sausage was considered the most likely source of infection. The ground lamb and hamburger were purchased from commercial establishments. It was thought they were contaminated from pork residue in the meat grinders. Although the commercially prepared bacon roll was labeled to be cooked, it was eaten raw. The other pork products were home processed.

#### Botulism

Epidemiological reports were received of 24 cases of botulism occurring in 10 outbreaks. In two of the outbreaks six cases were reported.

Table 3. Outbreaks of certain foodborne diseases reported in 1959, by type and source of food

Food	Salmonellosis		Shigellosis		Staphylococcal food poisoning		<i>Clostridium perfringens</i> infections		Gastroenteritis, etiology unknown	
	Outbreaks	Cases	Outbreaks	Cases	Outbreaks	Cases	Outbreaks	Cases	Outbreaks	Cases
Type of food										
Poultry.....	5	109			7	1,050	2	201	23	887
Other meat.....	5	895			31	1,912	2	24	52	395
Fish.....									9	86
Custard-filled dessert.....					19	131			10	163
Salad.....	1	32			15	613			14	539
Other.....	3	109			16	420			27	208
Not determined.....	5	283	2	37	1	12			46	1,996
Total.....	19	1,428	2	37	89	4,138	4	225	181	4,274
Source of food										
Public eating establishments.....	2	99			14	214	1	3	72	724
Private clubs.....	1	130			2	194			9	160
Schools.....	1	35	2	37	5	419			10	776
Colleges.....					2	83			1	425
Hospitals and institutions.....	3	777			7	1,104			11	641
Labor camps.....					1	66			3	138
Social gatherings.....	6	310			8	255	1	21	14	456
Private homes.....	5	40			32	163			47	181
Transportation.....	1	37			5	45	1	198	2	51
Picnics.....					4	1,496				
Other.....					8	97			8	591
Not stated.....					1	2	1	3	4	131
Total.....	19	1,428	2	37	89	4,138	4	225	181	4,274

number of *E. coli* organisms from water samples was much higher than usual. Since the carrier's campsite had no privy, fecal material probably was carried to the creek during the rainstorm. The city has recently installed a chlorinator and has introduced certain protective measures on the watershed.

A few cases of chemical poisoning resulted from copper carbonate which had formed in the copper tubing in a water fountain. A communitywide outbreak of hepatitis was thought to be due to contamination of wells by spring runoff water. In the other outbreaks private wells or springs were the sources of water.

### Milkborne Outbreaks

Eight of the eleven outbreaks considered to be milkborne were traced to contaminated milk products rather than to milk itself. A few cases of brucellosis found during a countywide survey for brucellosis in a midwestern State were attributed to raw milk from a dairy, but other cases in this county were not specifically linked to the dairy. Several cows in the dairy herd gave positive reactions to *Brucella* antigen. Two outbreaks of staphylococcal food poisoning were attributed to raw milk in private homes. Of the 11 outbreaks, 6 were confirmed as staphylococcal, 1 was brucellosis, and 1 was *Salmonella typhimurium* infection following ingestion of homemade ice cream. The etiologic agent for three was not determined.

An outbreak of some 200 cases of gastroenteritis occurring simultaneously in three schools was first thought to be due to a milkborne agent since milk was the only food used in common. However, investigation revealed that perhaps the infection was spread by person-to-person contact. This outbreak is included in the category "gastroenteritis, etiology unknown," in tables 2 and 3.

### Typhoid Fever

Water was considered the vehicle of infection in three of the five outbreaks of typhoid fever reported during 1959. The sources of water were a well at a resort, a well used by migrant laborers, and a public water supply (described under waterborne outbreaks). The outbreak at the resort involved four persons who visited the cabin of a woman later found to be a chronic

carrier or who rented or visited the cabin after she left. Typhoid bacilli, type E1, were isolated from the patients and from the well. The sewage from the cabin was discharged into a cesspool.

During the investigation of an outbreak following a wedding reception, *Salmonella typhosa*, type E1, was isolated from one of the women foodhandlers as well as from some of the patients. The foodhandler had not been ill. The suspect food was ham sandwiches. The other outbreak occurred among members of a family traveling by automobile part way across the country. The source of infection was not determined.

### Salmonellosis

Although outbreaks of salmonellosis reported in 1959 were fewer than in 1958, they resulted in more cases. During 1959, as in 1958, poultry and other meats were the most common foods involved. They were the vehicle in 10 of the 19 outbreaks. The most common sources of food were social gatherings and private homes, although the largest number of cases resulted from outbreaks in institutions. Eight species of *Salmonella* were recovered from patients or from food. These were: *S. typhimurium* in 7 instances, *S. blockley* in 3 instances, *S. bredeney* and *S. oranienburg* in 2 instances each, and *S. taksony*, *S. saint-paul*, *S. newington*, and *S. heidelberg* in one each. One report identified the organisms only as group C. In one of the outbreaks only a few clinical cases were reported, but on the basis of laboratory study of stool specimens it was estimated that the infection rate was as high as 50 percent of the 1,000 persons exposed. In this outbreak, *S. newington* was found in frozen eggs produced in another State. It was thought that a foodhandler became infected from the eggs and contaminated the meat. *S. newington* was recovered from the meat and from the block on which the meat was cut. In a laboratory study of an outbreak on an institutional farm in another State, *S. typhimurium* of the same phage type was isolated from inmates and three hogs.

### Shigellosis

In none of the six reported outbreaks of shigellosis was a particular vehicle identified,

# Final Report of Poliomyelitis Epidemic in Detroit and Wayne County, 1958

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**E**PIDEMIC poliomyelitis presents serious public health problems both during the acute phase and in the extended convalescent and recovery periods. During the 1958 epidemic in Detroit, the Detroit Health Department effectively mobilized its personnel and facilities to face these problems and has since used the experience gained to prevent their recurrence. A preliminary report of this epidemic was published in 1959 (1). This paper presents the final report of the 1958 poliomyelitis experience in Detroit and Wayne County.

The toll of the 1958 poliomyelitis outbreak was similar to that of prevaccine days: 874 cases of poliomyelitis, 462 nonparalytic and 412 paralytic, were reported in a population of 2,842,000 (fig. 1, table 1). There were 25 deaths (table 2); 177 cases were initially diagnosed as paralytic but on followup were found to have neither residual paralysis nor minor sequelae of poliomyelitis. Those significantly or severely disabled numbered 224; information was not available on 11. Table 3 shows the distribution of residual paralysis.

Few cases were reported prior to mid-July.

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*Data on poliomyelitis patients hospitalized at Herman Kiefer Hospital during the 1958 poliomyelitis epidemic were obtained from Dr. Donald C. Young, director of the communicable disease service. Virus studies were performed by Dr. Gordon C. Brown at the virus laboratory, University of Michigan School of Public Health, Ann Arbor.*

Then the number rose sharply, reaching a peak in mid-September (fig. 2). Cases continued to be reported throughout October, and sporadic cases persisted into November. The central area of Detroit was hardest hit; 91.6 percent of all paralytic cases in the city occurred in that area. Outside Detroit poliomyelitis has usually reached its peak in mid-August.

This was the 13th year of high poliomyelitis incidence for Detroit, and almost its worst—exceeded only by the 1952 incidence, when 748 cases were reported with 41 deaths (table 4). Wayne County had 344 cases in 1952, of which 152 were paralytic; in 1958 there were 225 cases, 66 of them paralytic.

The occurrence of poliomyelitis in epidemic proportions in the nonwhite population of Detroit in 1958 followed the trend of Chicago's experience in 1956 (2). Of the 346 paralytic cases in Detroit, 271 occurred in the nonwhite population (table 1). The specific rate for the nonwhite population was estimated at 57 per 100,000 compared with 5.2 per 100,000 for the white population. Thus, the rate for nonwhites appears to have been more than 10 times the rate for whites. This apparent increase in the proportion of paralytic cases among nonwhites has appeared since the advent of a preventive vaccine.

The incidence of nonparalytic cases was highest in the group aged 5–9 years. Males accounted for 56.1 percent of all cases (table 5). Poliomyelitis was diagnosed in 14 pregnant women. Four of these cases were paralytic. There were no fatalities among them.

In 60 families more than one person was diagnosed as having poliomyelitis in 1958; 44 of these cases were paralytic; none were fatal.

Seven of the twenty-four cases resulted in death. Beans were implicated in three outbreaks, beets in three, and mushrooms, whale flipper, fish eggs, and corn in one each. All the food was home processed. The corn, which had been discarded because it looked and smelled bad, was added to a mash for chickens. A child ate the mixture and became ill. Before the child was stricken, however, some 30 chickens that ate the mash had died. *Clostridium botulinum*, type A, was recovered from the suspect food in two outbreaks and type E in one. The type was not reported for another outbreak, and in the remaining outbreaks the particular food was not available for analysis.

### Staphylococcal Food Poisoning

About one-third of the 89 outbreaks of staphylococcal food poisoning reported during 1959 were attributed to meats other than poultry, most often ham. Custard-filled pastries were linked to 19 outbreaks. Most of the outbreaks occurred following meals in private homes, but most of the cases resulted from outbreaks among picnickers and in institutions. In some of the outbreaks occurring in private homes, the food was obtained from sources outside the home, especially the custard-filled desserts, which were often purchased from bakeries and consumed in the home. All but one of the staphylococcal food poisoning attacks listed in the transportation category occurred in airplanes. The State in which the plane landed was listed as the location of the outbreak.

### Gastroenteritis

The total of 182 outbreaks of gastroenteritis of undetermined etiology includes several outbreaks of only a few cases or of single cases which might possibly not have been due to the ingestion of food or water, but contaminated food or water (usually food) was considered the most likely cause. All outbreaks for which there was no laboratory evidence of a particular agent, either in the suspect food or water or from patients, are included in this group. The most frequent sources of food were public eating establishments (40 percent) and private homes (26 percent). Meats other than poultry were the foods most often involved or considered suspect. In many instances, no suspect food

was reported. Shellfish eaten in a restaurant was considered the food vehicle in one small outbreak. Investigation revealed that the shellfish, obtained from an authorized source, was probably leftover from a previous meal.

### Chemical Poisoning and Noxious Foods

A variety of agents were involved in incidents of chemical and noxious food poisoning. Two outbreaks were traced to meat additives, four to metals from beverage containers, two to foods inadvertently contaminated with chemicals, one to fish, three to mushrooms, and two to leaves of tree tobacco plants and night shade plants. One outbreak due to nitrites used in preserving fish occurred among persons living in two States. Fish from the same source was eaten in both restaurants and private homes. Three deaths were reported, but not all were attributed directly to the nitrite poisoning itself.

### *Clostridium perfringens* Infections

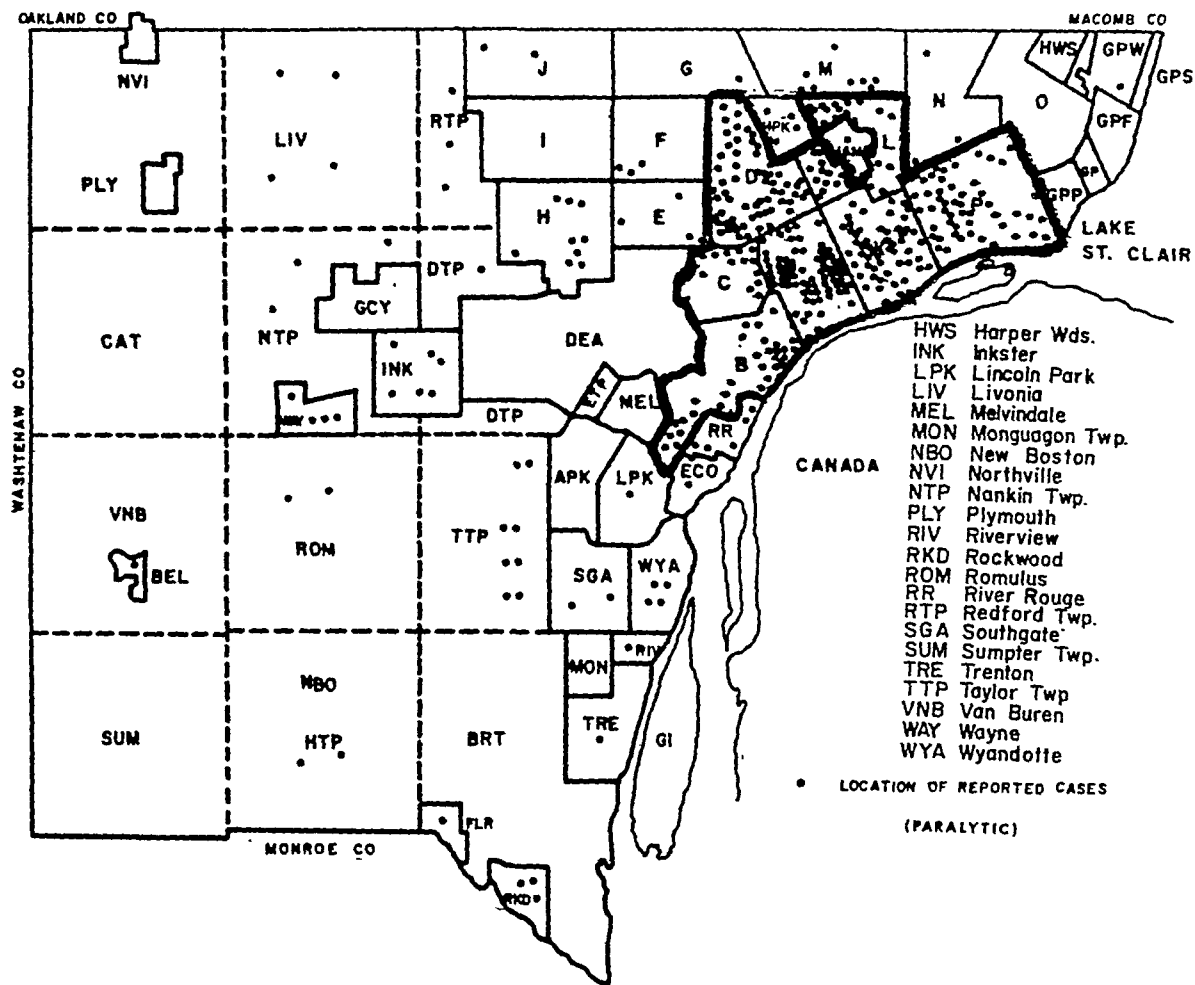
In 1959, for the first time in the United States, epidemiological reports were received of outbreaks in which *Clostridium perfringens* was determined to be the etiological agent. The first of four outbreaks occurred among passengers of an interstate train. One occurred at a family reunion and another in a restaurant. In one report, the place was not stated. *C. perfringens* was recovered from turkey in two of the outbreaks, from roast beef in one, and from salami in the other.

### Other Disease Outbreaks

One outbreak of streptococcal infection, at a college, was reported. Streptococci were isolated from a tuna-macaroni-mushroom dish. An outbreak in another State was found to be due to *Bacillus cereus*. The organisms were found in stool specimens from some of the patients and in samples of turkey.

### REFERENCES

- (1) Wallace, G. D., Quisenberry, W. B., and DeHarne, M. A.: Preliminary report of human staphylococcal infection associated with mastitis in dairy cattle. *Pub. Health Rep.* 75: 457-469, May 1960.
- (2) Dack, G. M.: Food poisoning. Chicago, University of Chicago Press, 1956.



In 1958, children under the age of 5 years accounted for 59.8 percent of Detroit's paralytic poliomyelitis cases (table 6). This percentage was highest in the central area (61.5 percent) and lowest in the outer area (41.3 percent). In the central area 80 percent of the patients with paralytic poliomyelitis were under 10 years of age. The majority of the paralytic cases, 55.8 percent, were in males. Fatalities were nearly three times as frequent in males as in females.

The average age of all patients reported as having poliomyelitis is shown in table 7.

#### Area Characteristics

In this report, Detroit and Wayne County have been divided into three areas, the central

and outer areas of Detroit proper and the remainder of Wayne County (fig. 1).

The central area of Detroit is that portion of the city which is contained in a half circle pivoting about the foot of Woodward Avenue at the Detroit River in downtown Detroit and extending outward for approximately 5 miles. This area is made up of census areas A, B, C, D, K, L, and P. It is an area of low income and low economic status. Housing is for the most part old and population density is high. There are several modern housing developments in the area. Most of the residents are nonwhite. They move frequently within the city and, for the most part, have resided in Detroit less than 10 years. Very few are natives of Detroit, but there are also very few recent in-migrants. Many are unemployed and

Figure 1. Nonparalytic and paralytic cases of

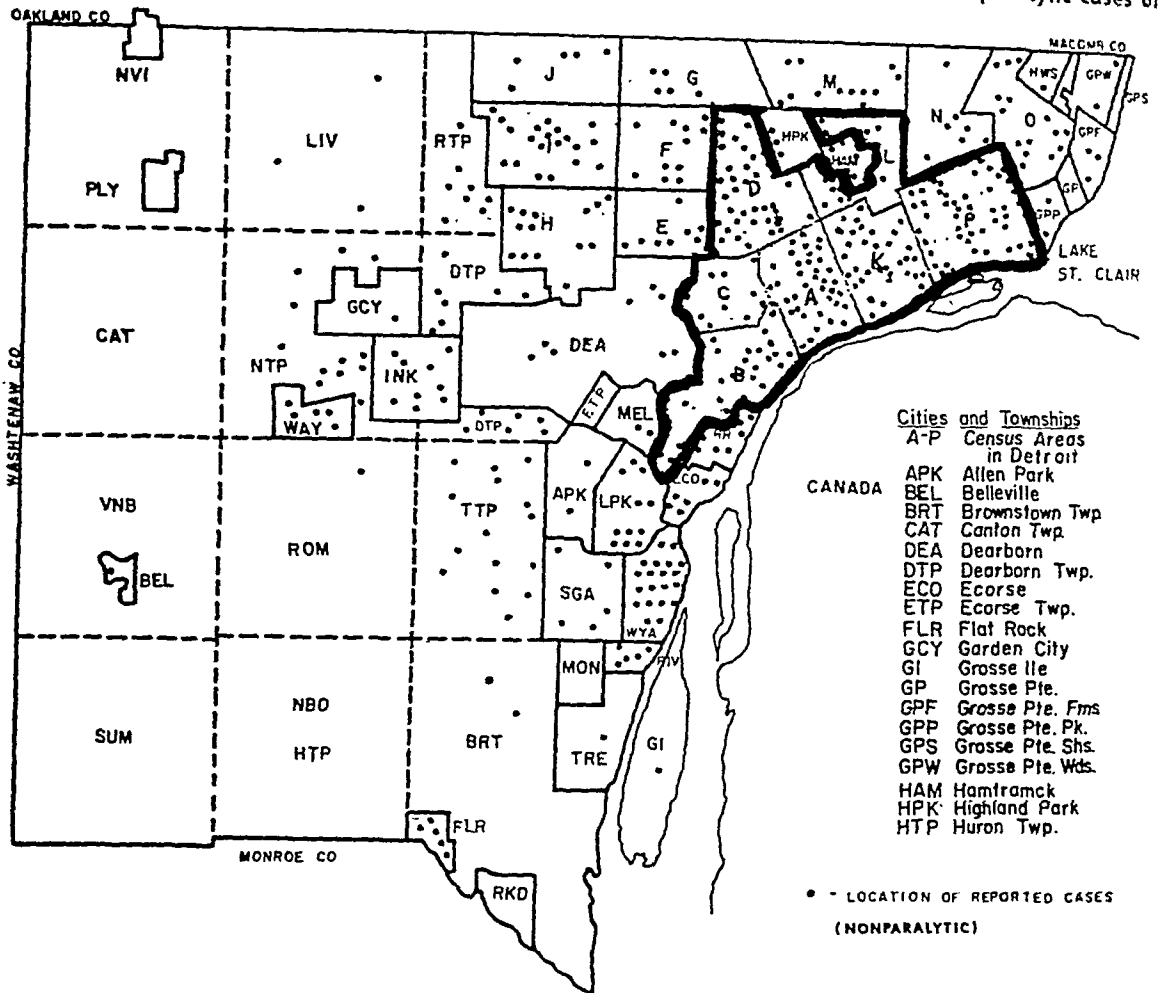


Table 1. Estimated population and number of reported paralytic and nonparalytic poliomyelitis cases in Detroit and Wayne County, Mich., 1958

Area	Estimated population			Poliomyelitis cases						
				Total reported	Paralytic			Nonparalytic		
	Total	White	Non-white		Total	White	Non-white	Total	White	Non-white
Wayne County.....	2, 842, 000	( <sup>1</sup> )	( <sup>1</sup> )	874	412	128	284	462	319	143
Detroit.....	1, 900, 000	1, 420, 000	480, 000	649	346	75	271	303	173	130
Central area.....	1, 094, 000	615, 000	449, 000	521	317	57	260	201	81	123
Outer area.....	806, 000	775, 000	31, 000	128	29	18	11	99	92	7
Remainder of county.....	942, 000	( <sup>1</sup> )	( <sup>1</sup> )	225	66	53	13	159	146	13

<sup>1</sup> Estimate not available.

Figure 2. Poliomyelitis cases reported in Detroit and Wayne County, Mich., by week of onset, 1958

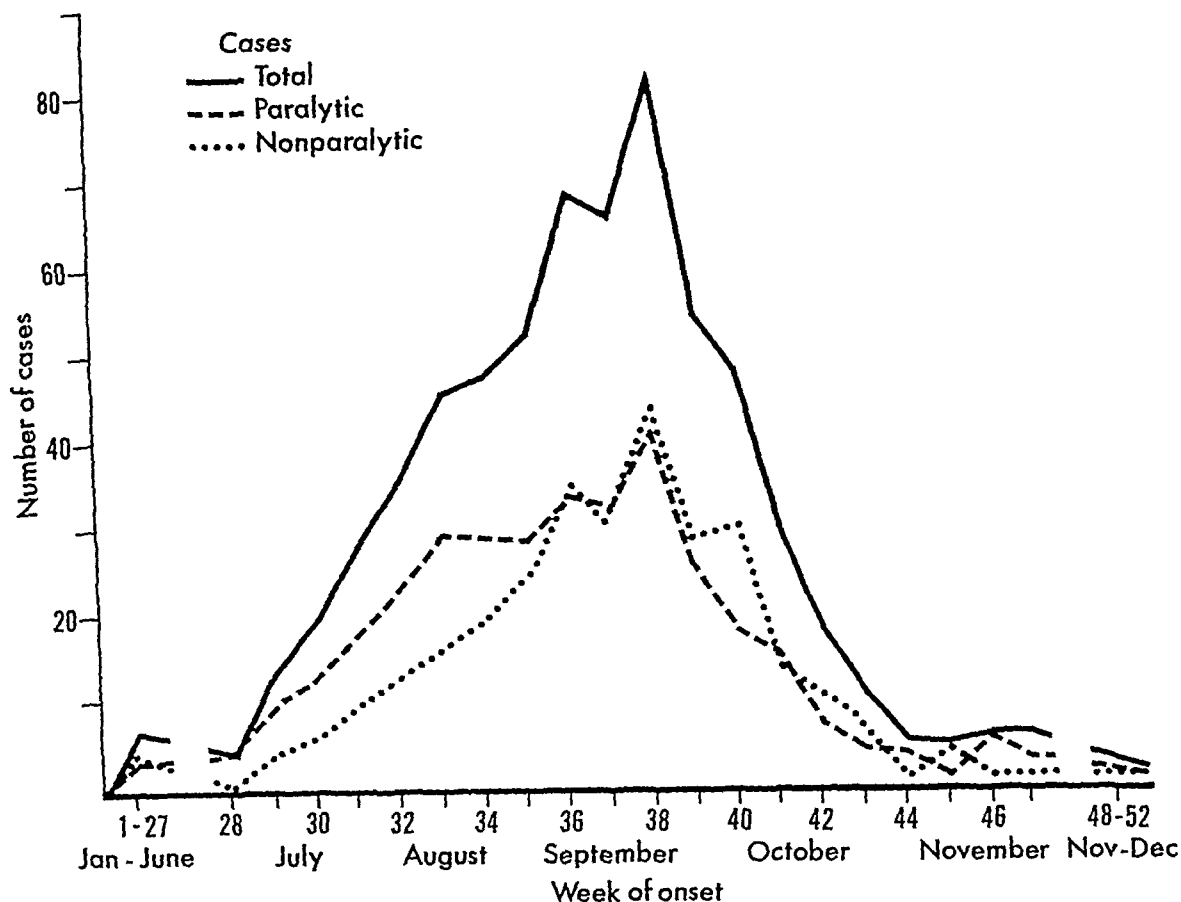


Table 4. Reported cases of poliomyelitis, by population and race, and reported deaths, Detroit, Mich., 1946-58

Year	Population	Reported cases						Deaths	
		Total	Rate per 100,000	White		Nonwhite		Number	Case fatality rate
				Number	Percent	Number	Percent		
1916..	1,750,000	315	18.0	239	75.9	76	24.1	27	8.6
1917..	1,785,000	219	12.3	188	85.8	31	14.2	6	2.7
1918..	1,815,000	192	10.6	174	90.6	18	9.4	6	3.1
1919..	1,825,000	553	30.3	521	91.2	32	5.8	27	4.9
1920..	1,816,000	400	21.7	367	91.8	33	8.2	27	6.8
1921..	1,896,000	371	19.6	311	83.8	60	16.2	11	3.0
1922..	1,945,600	748	38.5	665	88.9	83	11.1	41	5.5
1923..	1,995,650	559	28.0	503	90.0	56	10.0	25	4.5
1924..	2,000,000	519	27.5	462	84.2	57	15.8	25	4.6
1925..	1,902,000	249	13.1	200	80.3	49	19.7	2	.8
1926..	1,910,000	151	7.9	92	60.9	59	39.1	2	1.3
1927..	1,912,000	179	9.4	102	57.0	77	43.0	2	1.1
1928..	1,900,000	649	34.2	247	38.1	402	61.9	23	3.5



**Table 2. Deaths from poliomyelitis in Detroit and Wayne County, Mich., by age, race, sex, and area, 1958**

Age (years)	Total	Race and sex				Area		
		White		Nonwhite		Detroit		Remainder of Wayne County
		Male	Female	Male	Female	Central area	Outer area	
All ages.....	25	5	2	13	5	21	2	2
0-4.....	7	0	0	5	2	7	0	0
5-9.....	2	0	0	0	2	2	0	0
10-14.....	2	1	0	1	0	1	0	1
15-19.....	2	1	0	1	0	2	0	0
20-29.....	3	2	0	1	0	3	0	0
30-39.....	7	1	0	5	1	5	2	0
40 and over.....	2	0	2	0	0	1	0	1

receive some form of public assistance. About 58 percent of Detroit's population lives in the central area, and about 92 percent of the paralytic cases and 67 percent of the nonparalytic were reported from this population. The vaccination rate in the central area was low. Families received an average of 0.71 dose of poliomyelitis vaccine. Among adults, only females had received vaccine, provided by the State during pregnancy.

The outer area of Detroit is made up of census areas E, F, G, H, I, and J in the northwest part of the city and M, N, and O in the northeast part. The outer area has a population of 806,000, about 42 percent of the population of Detroit proper. This is the higher economic portion of the city, although there

are neighborhoods which contain low-income families. Eight percent of the paralytic and 33 percent of the nonparalytic cases were reported from this area. The residents had a much higher vaccination rate than those in the central area. In the northwest part of the city, families with diagnosed poliomyelitis, mostly nonparalytic, had received 2.0 doses per person; children had received an average of 2.2 doses. As in the central area, most adults receiving vaccine were females.

The major portion of Wayne County is outside the city of Detroit, to the west and south. This area includes the cities of Hamtramck and Highland Park, which lie within the city limits of Detroit, as well as some communities along Lake St. Clair, to the east of the city. The county varies from highly industrialized to distinctly rural areas, and from top-level to low-economic residential areas. Only the city of River Rouge, with population characteristics similar to those of central Detroit, approached central Detroit's paralysis rate. The number of reported cases was also high in Wyandotte and Inkster. Dearborn, with a population of 115,000, had no paralytic cases. The vaccination rate in Wayne County was low.

**Table 3. Residual paralysis among reported cases of poliomyelitis in Detroit and Wayne County, Mich., 1958**

Type of poliomyelitis	Total	Detroit	Remainder of Wayne County
Total cases.....	874	649	225
Nonparalytic.....	462	303	159
Paralytic.....	412	346	66
Residual paralysis:			
None.....	69	56	13
Mild.....	113	95	18
Moderate.....	129	111	18
Severe.....	76	61	15
Death.....	25	23	2

#### Epidemic Management

Each development of the poliomyelitis epidemic was noted or anticipated. The public was kept informed through close working re-

Figure 2. Poliomyelitis cases reported in Detroit and Wayne County, Mich., by week of onset, 1958

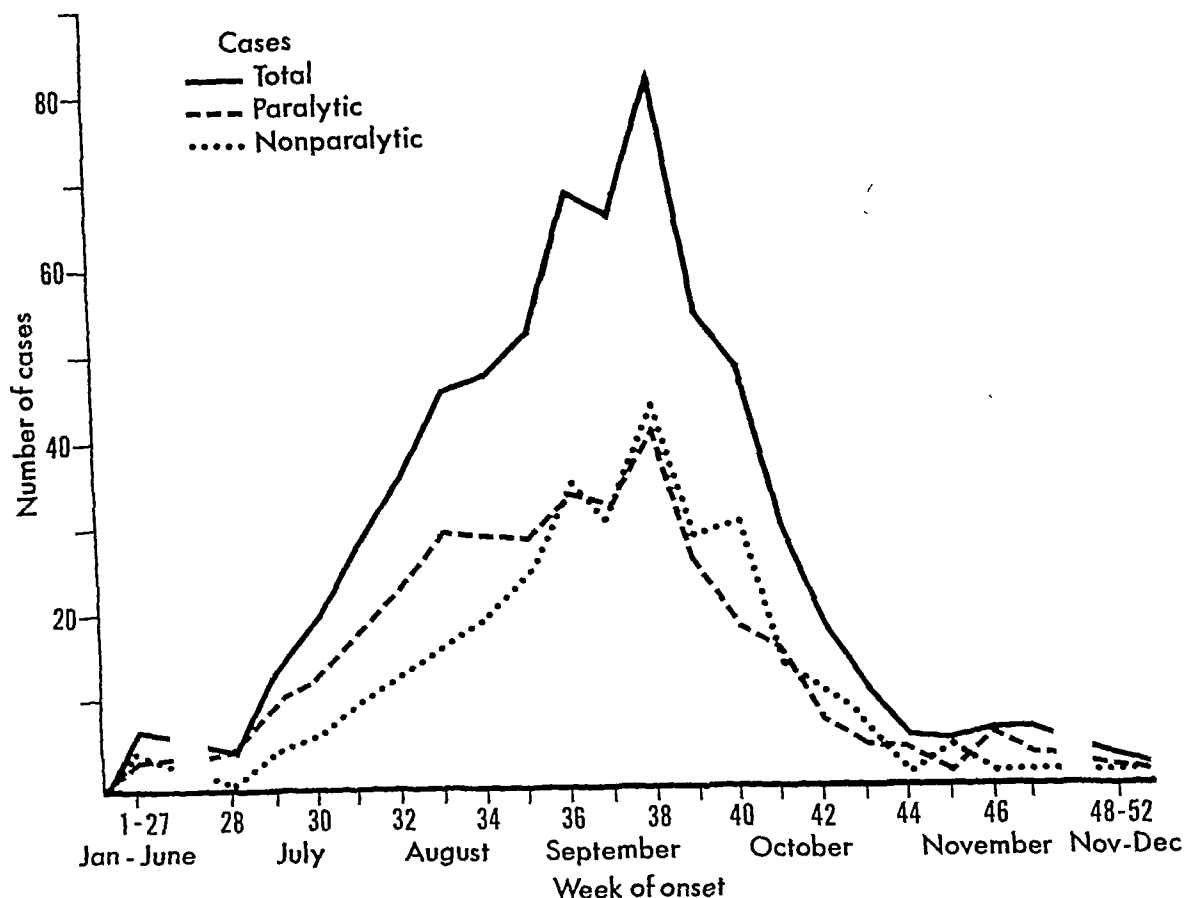


Table 4. Reported cases of poliomyelitis, by population and race, and reported deaths, Detroit, Mich., 1946-58

Year	Population	Reported cases						Deaths	
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				Number	Percent	Number	Percent		
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1949.....	1,825,000	553	30.3	521	94.2	32	5.8	27	4.9
1950.....	1,846,000	400	21.7	367	91.8	33	8.2	27	6.8
1951.....	1,896,000	371	19.6	311	83.8	60	16.2	11	3.0
1952.....	1,915,600	748	38.5	665	88.9	83	11.1	41	5.5
1953.....	1,995,650	559	28.0	503	90.0	56	10.0	25	4.5
1954.....	2,000,000	549	27.5	462	84.2	87	15.8	25	4.6
1955.....	1,902,000	249	13.1	200	80.3	49	19.7	2	.8
1956.....	1,910,000	151	7.9	92	60.9	59	39.1	2	1.3
1957.....	1,912,000	179	9.4	102	57.0	77	43.0	2	1.1
1958.....	1,900,000	649	34.2	247	38.1	402	61.9	23	3.5

Table 5. Reported cases of poliomyelitis in Detroit, Mich., by type of disease,

Age (years)	Total cases		Type of poliomyelitis				Sex			
			Nonparalytic		Paralytic		Male		Female	
	Num-ber	Per-cent	Num-ber	Per-cent	Num-ber	Per-cent	Num-ber	Per-cent	Num-ber	Per-cent
All ages.....	649	100 0	303	47. 7	346	53 3	364	56 1	285	43 9
Under 1.....	40	6 2	7	17. 5	33	82. 5	24	60 0	16	40 0
1-4.....	236	36 4	62	26. 3	174	73 7	137	58. 1	99	41. 9
5-9.....	166	25. 6	100	60. 2	66	39. 8	97	58 4	69	41. 6
10-14.....	70	10. 8	52	74. 3	18	25. 7	45	64. 3	25	35. 7
15-19.....	41	6. 3	27	65 9	14	34. 1	16	39 0	25	61. 0
20-29.....	55	8 5	29	52. 7	26	47. 3	27	49 1	28	50 9
30-39.....	32	4 9	20	62 5	12	37. 5	14	43. 8	18	56 2
40 and over.....	9	1. 3	6	66. 7	3	33. 3	4	44 4	5	55 6

relationships with the press, radio, and television. This up-to-the-minute knowledge of the situation was a result of prompt reporting of disease and of early home visits for epidemiological study and followup. Medical histories pointed up the very low rate of vaccination of the victims of the epidemic. The areas hardest hit were noted.

This information was used as a basis for setting up a crash immunization program sponsored by the Wayne County Medical Society, the Detroit and Wayne County Departments of Health, and the National Foundation. The

program was directed primarily at the epidemic area. Poliomyelitis protection clinics were held in churches, schools, recreational centers, and libraries—wherever the public could best be served. A full course of three injections was made available to all, regardless of the patient's ability to pay.

The program, from its beginning in mid-August to the end of the year, resulted in the administration of more than 630,000 injections of poliomyelitis vaccine. On the basis of vaccine sales, it is estimated that about twice this number of doses were given by private physi-

Table 6. Reported cases of paralytic poliomyelitis in Detroit, Mich., by age, sex, and race, 1958

Age (years)	Total		Sex				Race			
			Male		Female		White		Nonwhite	
	Number	Percent	Number	Percent	Number	Percent	Number	Percent	Number	Percent
All age.....	346	100 0	193	55 8	153	44 2	75	21 7	271	78 3
Under 1.....	33	9 5	21	63 6	12	36 1	5	15 2	28	84 8
1-4.....	174	50 3	97	55 7	77	44 3	23	13 2	151	86 8
5-9.....	66	19 1	34	51 5	32	48 5	16	21 2	50	75 8
10-14.....	18	5 2	11	61 1	7	38 9	7	38 9	11	61. 1
15-19.....	14	4 0	5	35 7	9	64 3	4	28 6	10	71. 1
20-29.....	26	7 5	17	65 1	9	34 6	11	53 8	12	46 2
30-39.....	12	3 5	7	58 3	5	41 7	3	25 0	9	75 0
40 and over.....	3	. 9	1	33 3	2	66 7	3	100 0	0	. 0

age, sex, and race, 1958

Race					
White			Nonwhite		
Number	Percent of—		Number	Percent of—	
	Age group	Total white cases		Age group	Total non-white cases
248	38.2	100.0	401	61.8	100.0
5	12.5	2.0	35	87.5	8.7
51	21.6	20.6	185	78.4	46.2
69	41.6	27.8	97	58.4	24.2
40	57.1	16.1	30	42.9	7.5
26	63.4	10.5	15	36.6	3.7
34	61.8	13.7	21	38.2	5.2
17	53.1	6.9	15	46.9	3.7
6	66.7	2.4	3	33.3	.8

cians, making a total of about 2 million injections.

In areas of high poliomyelitis incidence, 64.1 percent of the children returning to school in September had been vaccinated; 89.7 percent of the February 1959 entrants claimed such protection. In areas of low poliomyelitis incidence, the corresponding figures were 96.6 percent and 98.2 percent. Poliomyelitis protection is now available at health centers throughout the city on a weekly clinic basis, and an extensive school program has been set up.

About 85 percent of the cases of reported poliomyelitis in Detroit and Wayne County were cared for at Herman Kiefer Hospital, which is under the supervision of the Detroit Health Department. Both routine hospital care and diagnostic screening were the responsibility of the hospital's medical staff. Many cases came to the hospital from outside Detroit and Wayne County. As new admissions of acute poliomyelitis cases exceeded the capacity of the hospital, recently convalescent patients were transferred to other facilities. Routine followup examinations were done for patients 30 or more days after discharge.

### Epidemiology

In the Detroit epidemic, poliomyelitis sought its victims among the poorly vaccinated. There

was apparently little radial spread of the disease from one region to another in the heavily populated areas. Late in the season a shift to the rural areas of Wayne County was noted.

The number of doses and the date of injection of poliomyelitis vaccine were carefully determined for each reported case of poliomyelitis. In the city of Detroit, 95.1 percent of the patients with paralytic poliomyelitis had fewer than three inoculations of Salk vaccine, and 78.6 percent had no vaccine (table 8). Seventeen with paralytic poliomyelitis had three inoculations; none had four. None of the patients who died had had three inoculations.

A slightly different picture is seen in Wayne County outside Detroit. Here 74.2 percent of the patients with paralysis had received no vaccine, 83.3 percent had received fewer than three injections, and 11 patients, or 16.7 percent, had received three or more injections. One of the fatalities in Wayne County was an 11-year-old boy who had two injections of vaccine in 1955 and a third in 1957. This was confirmed from school records. There were no virus studies on this patient.

To measure the value of poliomyelitis vaccine,

**Table 7. Average age in years of reported cases of poliomyelitis in Detroit, Mich., for 1958, by sex, race, and type of disease**

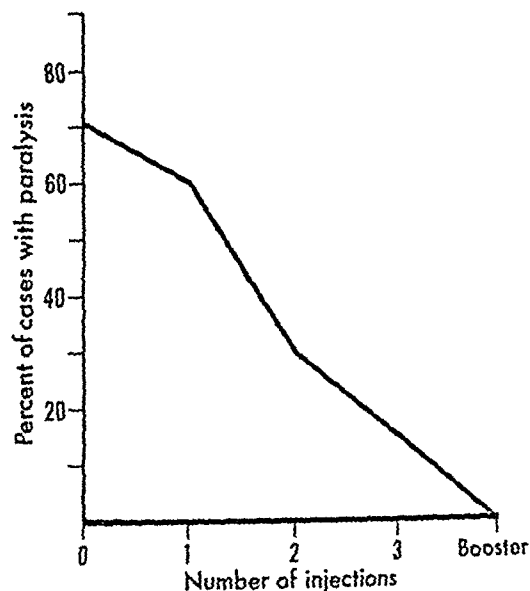
Sex	White	Non-white	Total
Nonparalytic			
Male.....	11.2	8.6	10.1
Female.....	15.8	10.6	13.5
Both sexes.....	13.2	9.5	11.6
Paralytic			
Male.....	14.8	5.5	7.2
Female.....	10.4	5.9	7.1
Both sexes.....	12.5	5.7	7.2
Nonparalytic and paralytic			
Male.....	12.1	6.5	8.6
Female.....	13.9	7.5	10.1
Both sexes.....	13.0	6.9	9.2

it would be helpful to know what proportion of the population was adequately protected in an area where the disease was epidemic, especially in the preschool age group. There are no easy means of determining those protected by virtue of inapparent infections, nor is the information obtained from informants concerning the individual's artificial immunization likely to be entirely correct. Such information needs careful verification. However, despite its limitations, the survey method represents a realistic approach to this problem. Serfling has formulated a useful sampling method for rapid survey of an area (3).

In order to have a basis for the effective promotion of immunization, a survey of current poliomyelitis immunity through vaccination was made in schools throughout Detroit. The index of relative vaccination coverage is indicated by the border in figure 1. While the data varied from school to school, on the average less than 50 percent of the children in elementary schools in the central area had had three inoculations of poliomyelitis vaccine. About 35 percent had had no vaccine at all. In the schools outside the central area a high protection level, indicated by the proportion of children having three or more inoculations, was demonstrated in well over 50 percent of the pupils. The correlation between the low rate of vaccination and the high incidence of paralytic poliomyelitis is graphically illustrated in figure 1. Because several immunization campaigns had been directed at the elementary school group in the central area during the preceding 3 years, apparently without marked success, a much lower state of immunization is believed to have existed in the preschool group at the time of the epidemic.

Studies made in Detroit and elsewhere have disclosed that not one but a variety of reasons were given to explain the lack of adequate protection against poliomyelitis through artificial immunization (4). Major factors seemed to be apathy, indifference, lack of "health awareness," ignorance of the facts concerning vaccination, outright opposition, or, in some instances, definitely expressed fear as to the safety of the procedure and of the vaccine. The unvaccinated group were not motivated by the usual mass media, such as newspapers, televi-

Figure 3. Paralysis rates related to number of injections of Salk poliomyelitis vaccine among reported cases of poliomyelitis, Detroit, Mich., 1958



sion, or radio, employed to promote immunization. Inability to pay for vaccination because of marginal income or unemployment, which was clearly evident in many instances, need not have been a deterrent. Clinics were available without cost and were close at hand: still they were not used. The lack of protection among young fathers was not limited to the central area of the city and would seem to indicate a serious failure of mass media to educate the entire public to the need for protection against poliomyelitis.

#### Herman Kiefer Hospital Admissions

Each year the communicable disease division of the Herman Kiefer Hospital admits more than 80 percent of all reported cases of poliomyelitis from the Detroit metropolitan area. This area includes the city of Detroit, and Wayne, Oakland, and Macomb Counties.

During 1958, 867 poliomyelitis patients were admitted to the hospital, 853 of them during the period July to November, and 955 patients were examined and returned to the care of private physicians. Of the 874 cases of poliomyelitis reported in Detroit and Wayne County, 742, or 84.8 percent, were cared for at Herman

Kiefer Hospital. The maximum number of patients admitted in one week was 117, during the week ending September 17. There were only 10 admissions through July 16. Many cases came from outside Detroit and Wayne County.

The 1958 hospital admissions were distributed as follows:

Area	Number cases	Number deaths
Detroit city-----	534	17
Remainder of Wayne County -----	208	2
Macomb County -----	76	6
Oakland County -----	45	0
Other -----	4	0
Total -----	867	25

Males exceeded females in all age groups. About 53 percent of the paralytic cases occurred in the 0-4 year age group; almost 60 percent were among nonwhites (table 9).

Forty percent of poliomyelitis admissions were for paralytic poliomyelitis (table 9) 84 percent of these patients had spinal involvement (table 10). Tracheotomies were performed on 27 patients, 18 of them males. Respirator cases numbered 54 (table 11). Thirty-eight were in males, and of these, 23 were nonwhite. Nine of the females were white. Most respirator cases were in the group aged 20 years and over.

Fatalities among patients admitted to the hospital numbered 25 (table 11). Twenty were

**Table 8. Number and percent of Salk vaccine injections<sup>1</sup> among all cases and among paralytic cases of poliomyelitis, by sex and race, Detroit, Mich., 1958**

Number of injections	Total		Males		Females		White		Nonwhite	
	Num- ber	Per- cent	Num- ber	Per- cent	Num- ber	Per- cent	Num- ber	Per- cent	Num- ber	Per- cent
All cases										
0-----	365	59.3	214	58.8	171	60.0	103	41.5	282	70.3
1-----	55	8.5	33	9.1	22	7.7	18	7.3	37	9.2
2-----	81	12.5	44	12.1	37	13.0	27	10.9	54	13.5
3-----	121	18.6	71	19.5	50	17.5	94	37.9	27	6.7
4-----	7	1.1	2	.5	5	1.8	6	2.4	1	.3
Total-----	649	100.0	364	100.0	285	100.0	248	100.0	401	100.0
Average-----	0.94		0.94		0.93		1.52		0.57	
Paralytic cases										
0-----	272	78.6	154	79.8	118	77.1	54	72.0	218	80.5
1-----	33	9.6	17	8.8	16	10.5	8	10.7	25	9.2
2-----	24	6.9	12	6.2	12	7.8	2	2.7	22	8.1
3-----	17	4.9	10	5.2	7	4.6	11	14.6	6	2.2
4-----	0	.0	0	.0	0	.0	0	.0	0	.0
Total-----	346	100.0	193	100.0	153	100.0	75	100.0	271	100.0
Average-----	0.38		0.37		0.40		0.60		0.32	

<sup>1</sup> The peak of poliomyelitis cases occurred during an intensive Salk vaccine inoculation drive which was instituted in mid-August following several weeks of sustained high incidence of poliomyelitis cases to raise the antipoliomyelitis immune state in the general population and thus possibly to abort the epidemic. Thus, many persons received poliomyelitis vaccine inoculations at time of onset of poliomyelitis or after onset. Since the inoculations were received too late to affect resistance to infection, these inoculations were considered, for analytic purposes, as not having been received. Statistical tests indicated that inoculations received at time of or following onset of poliomyelitis did not prevent or cause infection or paralysis, nor did these inoculations modify or enhance the extent of residual paralysis among paralytic cases.

For the most part, these inoculations have been verified by a check of health department clinic records and by confirmation by private physicians who gave inoculations to patients. In less than 10 percent of the cases were statements by parents or guardians the sole verification accepted.

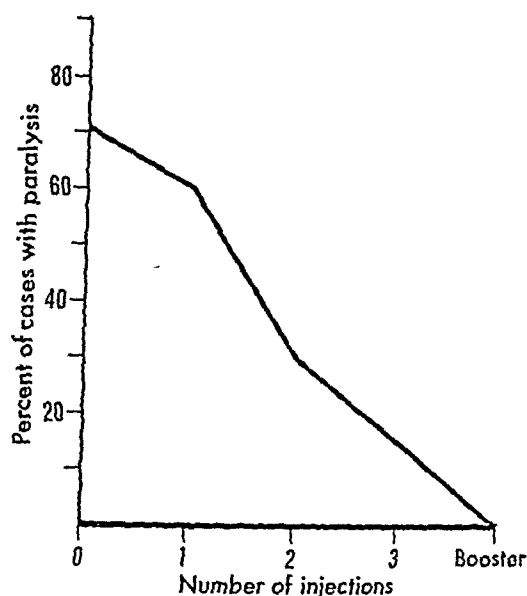
NOTE: For nonparalytic cases the average number of injections was 1.6. Adults and children received about the same average number.

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#### **Herman Kiefer Hospital Admissions**

Each year the communicable disease division of the Herman Kiefer Hospital admits more than 80 percent of all reported cases of poliomyelitis from the Detroit metropolitan area. This area includes the city of Detroit, and Wayne, Oakland, and Macomb Counties.

During 1958, 867 poliomyelitis patients were admitted to the hospital, 853 of them during the period July to November, and 955 patients were examined and returned to the care of private physicians. Of the 874 cases of poliomyelitis reported in Detroit and Wayne County, 742, or 84.8 percent, were cared for at Herman

among males, and of these, 10 were white. Deaths among females numbered five; three were white. Fourteen deaths occurred in the 20-year and over age group; 11 were males. Of the six deaths among nonwhites, five were in males.

The admitting-room service functioned as a diagnostic and screening agency. During an epidemic of poliomyelitis-like illness a discussion of the differential diagnosis between nonparalytic poliomyelitis, aseptic meningitis, and Cocksackie or ECHO virus infection is completely academic. Any patient with any signs and symptoms that might be those of poliomyelitis was admitted to the nearest hospital, where observations and treatment could be given as needed.

The classic, biphasic type of onset was seldom seen in this epidemic. The duration of illness prior to examination ranged from 1 to 7 days, the majority ranging from 2 to 4 days. The most common symptoms were severe headache, vomiting, malaise, and generalized aching. Upper respiratory tract symptoms were common.

Physical findings included stiffness of the neck and back of varying severity and a temperature of 100° to 103° F. and higher in patients with bulbar or intercostal involvement. Many patients were paralyzed at the time of admission. Five cases exhibited a mild, discrete, morbilliform rash.

Acute and convalescent phase blood specimens and a stool specimen from 556 patients

**Table 9. Type of poliomyelitis among patients admitted to Herman Kiefer Hospital, Detroit, Mich., during 1958, by age, sex, and race**

Age, sex, and race	Total	Nonparalytic	Paralytic
Total cases-----	867	520	347
Age (years)			
0-4-----	285	102	183
5-9-----	215	146	69
10-19-----	185	142	43
20 and over-----	182	130	52
Sex			
Male-----	495	307	188
Female-----	372	213	159
Race			
White-----	512	372	140
Nonwhite-----	355	148	207

**Table 10. Type of paralytic poliomyelitis among patients admitted to Herman Kiefer Hospital, Detroit, Mich., by sex, 1958**

Type of paralytic poliomyelitis	Total	Male	Female
Total cases-----	347	188	159
Spinal-----	292	151	141
Bulbar-----	17	10	7
Spinobulbar-----	29	21	8
Encephalitic and other---	9	6	3

**Table 11. Tracheotomies, respirator cases, and deaths among poliomyelitis patients admitted to Herman Kiefer Hospital, Detroit, Mich., by sex, 1958**

	Total	Male	Female
Tracheotomies-----	27	18	9
Respirator cases-----	54	38	16
Deaths-----	25	20	5

were subjected to virus studies (table 12): 433 stools and 112 paired blood specimens were examined; 11 examinations were incomplete (5).

Type 1 and type 3 polioviruses were obtained from the stools of paralytic patients, with type 1 predominating (table 12). No type 2 virus was recovered. Poliovirus was recovered from the stools of 72.0 percent of the paralytic cases and from 20.2 percent of the nonparalytic cases. Positive virus findings correlated fully with the clinical diagnoses in the paralytic cases. Recovery of poliovirus from nonparalytic cases in the Detroit central area exceeded considerably the recovery of other identifiable viruses, with the reverse being true outside the central area. More comprehensive laboratory data, from specimens collected throughout Michigan during 1958, have been reported by Brown and associates (5).

A majority of the patients with nonparalytic disease were hospitalized for 7 to 10 days. A few with extreme stiffness required hot packs and physical therapy for several weeks. The minimum period of hospitalization for patients with paralytic poliomyelitis was 14 days. Twenty patients, all with severe involvement, required very extensive treatment. It was the



## Use of an Aluminum Phosphate Vaccine

There has been some discussion as to whether it is advisable to inoculate infants with vaccines using aluminum phosphate (or alum) as the mineral carrier during and immediately preceding the "polio season" because of the possibility of such agents "provoking" paralytic poliomyelitis in subsequently exposed individuals. Hill and Knowelden reported this phenomenon in the *British Medical Journal* for July 1, 1950, in reference to children receiving their first dose of diphtheria, tetanus, pertussis (DTP) vaccine within a month or so of the seasonal incidence of poliomyelitis in Great Britain.

Quite inadvertently, we were able to observe the experience of infants receiving such a substance just prior to the 1958 epidemic of poliomyelitis in Detroit and Wayne County, Mich. During the spring of 1958, the Detroit Department of Health had initiated a rather extensive clinical trial of Quadrigen, a multiple antigen containing poliomyelitis, diphtheria, tetanus, and pertussis antigens adsorbed onto aluminum phosphate. In this study 446 infants, ranging in age from birth through 6 months at the time they were placed on their primary series of inoculations, received four inoculations of Quadrigen at monthly intervals. Another 211 infants of the same age range were placed on a similar course of a standard DTP vaccine, in which aluminum phosphate was also the mineral carrier.

All children received their first dose in April, their second in May, their third in June, and completed their fourth dose by mid-July 1958. A single dose of Quadrigen was given to 460 children from both groups who returned for their "booster" in January 1959.

The Detroit poliomyelitis epidemic occurred between July and November 1958, reaching its peak in mid-September. This was Detroit's worst outbreak of paralytic poliomyelitis since 1952, with 346 reported paralytic cases in the city, nearly 10 percent of which occurred in infants under 1 year of age. Virus isolation studies performed by Dr. Gordon Brown of the University of Michigan on a number of patients revealed a preponderance of type 1 poliovirus infections (77 percent type 1 isolated from stools), with type 3 found to a lesser extent (23 percent type 3 isolated from stools). Type 2 apparently was not involved. Most of the children receiving Quadrigen or DTP antigen in the study

population came from homes in the geographic areas of the city hardest hit by the epidemic.

Because of the 211 children receiving DTP antigen but no poliomyelitis vaccine before or during this epidemic (these children received their poliomyelitis vaccine inoculations January through April of 1959), we were able to measure the impact of the epidemic on our study population. Blood tests revealed that 42 of these children experienced an unexplained but significant rise in antibody titer to type 1 poliovirus and to a lesser extent to type 3 after their primary series of DTP inoculations and before their booster dose of Quadrigen. This rise was also seen in the Quadrigen-inoculated groups. Among infants showing an unexplained rise in poliovirus antibody titer, a rise in type 1 antibody titer occurred in 73 percent (109 of 150 determinations), and in type 3 in 27 percent. No such phenomena occurred in respect to type 2 antibody levels. This serologic pattern in the controls would seem to confirm the virus isolation studies of Dr. Brown and, if this presumption is correct, definitely indicates that our study population received a heavy exposure to type 1 virus and to some extent to type 3.

Naturally, we have been concerned as to whether any of our study babies contracted poliomyelitis, and we are happy to report, after an extensive review of our records, that none of these children contracted clinically recognizable poliomyelitis either during this epidemic or at any time since. From this limited but timely experience we are in a position to say there is no apparent provocative effect from intramuscular immunizations with Quadrigen or DTP preparation with A1P04 in precipitating paralytic poliomyelitis infection in a child. We know of no reason why these observations would not apply with equal validity to poliomyelitis vaccine preparations using aluminum phosphate as a mineral carrier. We have also had these preparations under clinical investigation. Results of these studies are in preparation for a paper which will be submitted for publication in the near future.—JOSEPH G. MOLNER, M.D., M.P.H., health commissioner, City of Detroit, and C. DALE BARRETT, JR., M.D., M.P.H., director of maternal and child health, Detroit Department of Health.

November. The final count showed 412 paralytic cases and 25 fatalities. More than three-quarters of the paralytic cases were concentrated in the central area of the city and largely involved a Negro population of low economic status. Sixty percent of the paralytic victims of the disease in Detroit had not yet reached their fifth birthday. Those in their second year of life were most susceptible.

The epidemic was due to type 1 and type 3 polioviruses, with type 1 predominating. Victims of paralytic disease had received little or no Salk vaccine. A crash immunization program was inaugurated during the epidemic. Well-advertised poliomyelitis protection clinics were set up throughout the county but were especially concentrated in the epidemic areas.

The pattern of poliomyelitis in a large city and community 4 years after Salk vaccine became available demonstrates the high level of protection afforded by the recommended number of doses of this vaccine. On the basis of effort directed at all levels of the population and a high per capita rate of inoculation with Salk vaccine, it had been believed that protection against poliomyelitis was at a safe level in Detroit. However, the distressing epidemic occurrence of paralytic poliomyelitis in infants and children concentrated largely in low-income groups evidenced not only pockets of the population which had received little or no vaccine but also demonstrated the cyclic, unpredictable character of the disease in those who lacked adequate protection.

An outbreak of poliomyelitis as severe as that which occurred in Detroit can best be prevented by searching for pockets of low artificial pro-

tection, making vaccination readily available to all, and, for some elements of the population, resorting to intensive personal persuasion or education to encourage inoculation. The peak occurrence of the paralytic cases in the second year of life indicates not only the urgent need to give protection as early in infancy as is possible, but offers a key to prevention of epidemics. Since births are a matter of public record, the effective followup of every infant during its first year of life seems the logical approach to building solid protection against poliomyelitis into a community.

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impression of clinicians at the hospital, based on carefully obtained histories, that trauma and fatigue apparently played a very minor role in production of paralysis in the cases seen during 1958.

Two cases of poliomyelitis frequently occurred in the same family. In September, four members of a family, the father and three children, were admitted to the hospital. The father had paralysis of all extremities and intercostal muscles and required treatment in a respirator. One of the children had paralysis of a lower extremity; the other two were nonparalytic.

Three patients returned to the hospital with second attacks of poliomyelitis. Two were nonparalytic in type during both admissions. Poliovirus was recovered from the stools of both of these patients on both first and second admissions. Each illness was caused by a virus

of different type. The third patient had non-paralytic disease on the first admission and encephalitis plus paralysis of a lower extremity on the second.

During September, it was necessary to transfer convalescents to general hospitals, convalescent centers, and the rehabilitation center in Detroit, in order to obtain space for acute cases.

### Summary and Conclusions

During 1958 Detroit and Wayne County, Mich., experienced a poliomyelitis epidemic which contrasted sharply with the racial and regional occurrence of this disease characteristic of outbreaks in the past.

The epidemic commenced late in July, reached a peak in September, and ended in

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Area	Total stools examined	Virus isolated									
		Poliomyelitis					Other				
		Number			Percent	Positive			Negative		
		Type 1	Type 3	Total		Number			Percent	Number	Percent
						Cox-sackie	ECHO	Total			
Paralytic cases <sup>2</sup>											
Detroit:											
Central area.....	169	93	31	124	73.4	0	0	0	0	45	26.6
Outer area.....	17	10	0	10	58.8	0	0	0	0	7	41.2
Remainder of Wayne County.....	39	26	2	28	71.8	0	0	0	0	11	28.2
Total.....	225	129	33	162	72.0	0	0	0	0	63	28.0
Nonparalytic cases											
Detroit:											
Central area.....	97	23	8	31	31.9	5	17	22	22.7	44	45.4
Outer area.....	52	4	0	4	7.7	2	7	9	17.3	39	75.0
Remainder of Wayne County.....	59	5	2	7	11.7	0	13	13	22.1	39	66.2
Total.....	208	32	10	42	20.2	7	37	44	22.2	122	58.6
Grand total.....	433	161	43	204	47.1	7	37	44	10.2	185	42.7

<sup>1</sup> Paired blood specimens only were examined from 112 patients; examinations of 11 were incomplete.  
<sup>2</sup> Paralytic cases received 60-day followup.

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# Racial Differences in Visual Acuity

BERNARD D. KARPINOS, Ph.D.

CERTAIN VISUAL STANDARDS have been established by the Armed Forces in determining an individual's qualification for military service (1). Consequently, testing of vision constitutes an integral part of the medical examinations conducted by the Armed Forces examining stations.

The current visual standards with respect to induction or enlistment for military service are expressed in terms of distant vision. The following procedures are prescribed by the Army regulations in regard to testing visual acuity (1):

Visual acuity will be determined at a distance of 20 feet or the mirror equivalent under standard conditions of illumination. The illumination of the target chart shall be between 12- and 18-foot candles. This degree of illumination may be obtained by a 200-watt lamp, 5 feet diagonally from the 20/20 line in the target, and incident to this part of the chart at an angle of 45°. All lamps must be shielded from the direct vision of the examinee by an opaque shade. The individual to be tested, if wearing glasses, will remove them before entering the examining room, and then will be seated without viewing the test chart. Individuals awaiting the test must be kept out of bearing distance. The examiner holds the occluder and covers the candidate's left eye, while instructing the examinee to keep both eyes open without squinting. The occluder must not be permitted to touch any part of the eye to be shielded, but will be held in contact with the side of the nose. The examinee is then directed to begin with the first (visible) line and to read as many as possible. The acuity for the left eye is then tested, using a different chart or by having the examinee read the lines backward. An individual who normally wears glasses is tested again with them in place, following the same procedure. Where there is a suspicion that the examinee has memorized the charts, he is directed to read the letters or targets

in reverse order or will be shown a different chart. The individual is expected to read the letters promptly. No precise time limit will be applied, but 1 or 2 seconds per letter is ample time. When an individual fails a letter or target, he will not be asked to read it again. If the individual is a rapid reader and his mistakes are obviously careless ones, he will be cautioned to "slow down" and the test will be repeated on another chart. Vision is recorded in the form of a fraction. The upper number is the distance in feet from the target, and the lower number is the value of the smallest test chart line read correctly. Thus a person reading the 30-foot test chart line at a distance of 20 feet is given a score of 20/30. A score of 20/20 indicates the person reads test chart line marked 20 at a distance of 20 feet. Similarly, 20/200 means that person reads only the test chart line marked 200 from a distance of 20 feet.

The findings of the visual testing are recorded on the examinee's medical examination report (Standard Form 88, item 59), for each eye separately. Both the examinee's uncorrected and correctable distant vision are recorded, in Snellen notation. The following analysis of racial differences in visual acuity is based on these findings.

## The Sample

The analysis deals with Selective Service registrants examined by the Armed Forces examining stations during the 21-month period from January 1957 through September 1958. The stations are required to submit to the Office of the Surgeon General, Department of the Army, a copy of the medical examination report of each registrant disqualified by them for military service and of each qualified registrant inducted into the Army.

During this period, 50 percent of the submitted medical reports were coded for use in the study. To assure randomness, the sample was selected by taking all reports of the disqualified registrants whose Selective Service

*Dr. Karpinos is chief of the Prevalence Studies Section of the Medical Statistics Division in the Office of the Surgeon General of the Department of the Army.*

## Search for Energy Sources

Solar and nuclear energy were among the topics discussed at the International Conference on Science in the Advancement of New States which was held August 15-30, 1960, at the Weizmann Institute of Science, Rehovoth, Israel. More than 500 statesmen, scientists, scholars, and observers, representing 31 countries and 5 continents, attended the conference.

Dr. Alvin M. Weinberg, director of the Oak Ridge National Laboratory at Oak Ridge, Tenn., spoke on the eventual possibility of achieving autarky in energy by the use of breeder reactors, which manufacture more fuel than they consume.

Weinberg said he did not wish to encourage the statesmen present at the conference to go into the nuclear business in their new states. He urged that most of them wait until breeder reactors have been developed further, suggesting their use might become economically feasible in certain areas within 15 years. He also warned about the danger of starting large-scale nuclear energy programs until the problem of radioactive waste disposal had been solved.

"I think an economically autarkic world would be a more stable place than an economically interdependent world," Weinberg stated. "There are many examples of how concern for the supplies needed to produce energy or for other raw materials has led to acute anxiety and tension. The Suez crisis in 1956 is only one of many such crises which can be traced to worry over energy-producing materials. One need only imagine the course of events at Suez had all the countries involved at the time been truly self-sufficient in regard to energy. If their energy systems had been based on domestic uranium and thorium and the problem of converting nuclear energy into petrochemicals had been solved, it is hard to see how access to the Middle East could have become a major political issue."

The paper presented by Dr. Henry Tabor of the National Physical Laboratory of Israel dealt with solar energy as a source of power.

Tabor described a solar pool built to employ his system near the Dead Sea Works at S'dom. Salts are dissolved at the bottom of the pool, making the bottom layer of water heavier and preventing it from rising to the surface even when it has become hotter. Although the top layer remains at a stable temperature because it loses heat at the same rate as it picks it up, the lower level of water gradually gets hotter if it is undisturbed.

Tabor reported that a solar pool covering 1 square kilometer would produce heat valued at \$300,000 annually and would cost \$1 to \$1.5 million to construct. He estimated that such a pool would produce 6,000 kilowatts of electricity whenever the sun was shining. The cost of installed capacity would be only about \$250 per kilowatt, less than the estimated cost per kilowatt of production by nuclear power stations when they become operative.

He pointed out that most undeveloped countries have considerable quantities of flat land, salt, and hot sun, the three requirements for building solar pools. Salt is frequently present in flat areas, where very large pools could be built, and there are tens of thousands of square kilometers of such land in the world.

Three urgent needs of new states in the next 15 years were emphasized in discussions following the regular sessions of the conference:

1. Short-range programs carried out with the help of societies wealthier in capital and know-how, rather than long-range benefits from science.

2. Immediate training of administrative and technological personnel.

3. Small power rather than huge energy reactors. In this connection, Tabor's solar pool and the suggestion that wind power might be usable produced favorable response.

Discussion of desalination of sea water also impressed conference delegates, many of whom came from new states suffering shortage of sweet water.

necessary for proper evaluation of the data to weight the separate cross-tabulations to agree with the ratios obtained from the monthly reports. The weighting actually resulted in multiplying the cross-tabulations of the white inducted registrants by 1.99 and those of the Negro inductees by 1.42, cell by cell, and then combining these adjusted cross-tabulations with the corresponding cross-tabulations of the disqualified examinees. Obviously, the assumption was made that the distributions of all qualified registrants by visual acuity were the same as those who were qualified and inducted, a reasonable assumption.

### Uncorrected Distant Vision

From the combined (weighted) cross-tabulations of uncorrected vision by right and left

eyes, separate cross-tabulations were derived for white and Negro examinees (table 2). The distributions are shown to a base of 100,000 for white and 10,000 for Negro examinees. The difference in the bases is due to the difference in the total numbers involved.

Vision marked in the table as less than 20/400 includes light perception; blind includes missing eye. No persons blind in both eyes are indicated by the table, since such persons are ordinarily screened out by the local boards before being forwarded to the examining stations.

These distributions clearly reveal relatively poorer distant vision for the white than for the Negro examinees. For instance, as shown in table 2, 69 percent of the white examinees had 20/20 uncorrected bilateral vision compared

**Table 2. Distribution of registrants examined for military service by uncorrected distant vision in right and left eyes, by race, January 1957–September 1958**

Vision in left eye <sup>1</sup>	Vision in right eye <sup>1</sup>										Total
	20/20	20/30	20/40	20/50	20/70	20/100	20/200	20/400	<20/400	Blind	
White											
20/20.....	69,348	2,289	380	212	270	152	235	281	104	104	73,375
20/30.....	2,576	4,259	615	220	219	102	127	82	32	14	8,246
20/40.....	416	559	920	273	240	91	77	46	17	5	2,644
20/50.....	228	223	223	557	251	94	75	23	11	2	1,687
20/70.....	326	228	228	214	996	299	183	55	24	4	2,557
20/100.....	189	120	101	94	269	1,015	389	92	31	3	2,303
20/200.....	295	126	75	86	183	303	2,282	370	114	8	3,842
20/400.....	349	99	43	30	67	77	322	1,957	649	5	3,598
<20/400.....	130	40	18	13	26	29	114	678	569	4	1,621
Blind.....	84	12	5	2	5	4	6	4	5	-----	127
Total <sup>2</sup> .....	73,941	7,955	2,608	1,701	2,526	2,166	3,810	3,588	1,556	149	100,000
Negro											
20/20.....	8,217	195	28	15	14	7	14	18	12	11	8,531
20/30.....	220	412	41	14	11	5	3	4	2	1	713
20/40.....	33	49	78	16	12	3	2	2	1	-----	196
20/50.....	17	16	16	38	12	4	1	1	1	-----	106
20/70.....	18	12	10	9	53	13	5	2	1	-----	123
20/100.....	9	5	4	3	9	38	11	1	2	-----	82
20/200.....	13	5	2	1	4	7	66	8	4	-----	110
20/400.....	18	3	1	1	2	1	5	30	14	1	76
<20/400.....	12	2	1	1	1	1	3	15	13	-----	49
Blind.....	11	2	-----	-----	-----	-----	1	-----	-----	-----	14
Total <sup>3</sup> .....	8,568	701	181	98	118	79	111	81	50	13	10,000

<sup>1</sup> Snellen notation.

<sup>2</sup> Base used is 100,000.

<sup>3</sup> Base used is 10,000.

Source: Medical examination reports (Standard Form 88) of registrants examined for military service by the Armed Forces examining stations.



number assigned to them by their local boards ended in an odd digit, and all reports of the inducted registrants whose Armed Forces service number ended in an odd digit. The sample included some 276,000 medical reports. The medical and personal data coded from these reports were put on punchcards.

Visual data, involving one or both eyes, were missing on 2.0 percent of the medical examination reports of disqualified registrants (2.1 percent for whites and 1.8 percent for Negroes) and on 0.2 percent of those of inducted registrants (0.2 percent for whites and 0.3 percent for Negroes). Eliminating these, the final sample used in the analysis comprised some 273,000 medical reports of registrants with known distant vision. These reports were distributed as follows by race and military qualification of the examinees:

Race	Disqualified	Inducted	Total
White (non-Negro) -----	109,516	111,794	221,310
Negro -----	36,893	14,389	51,282
Total -----	146,409	126,183	272,592

These examinees presented a young population: the mean age (as of last birthday) of the white examinees was computed as 21.8 years, and that of the Negro as 21.6 years. Somewhat more than one-half of both white and Negro examinees were 22 years of age (table 1).

#### Data Tabulated and Adjusted

From the coded visual data the following cross-tabulations were prepared for each of the four groups—white disqualified, white inducted, Negro disqualified, Negro inducted:

Uncorrected vision of right eye by uncorrected vision of left eye.

Uncorrected vision of right eye by correctable vision in the same eye.

Uncorrected vision in left eye by correctable vision in the same eye.

To carry out the analysis of the total examined groups by race, the cross tabulations of the disqualified examinees, by race, had to be combined with those of the inductees who were taken as representative of the total qualified group.

These cross-tabulations indicated differences in distant vision between races, as well as be-

**Table 1. Percentage distribution of registrants examined for military service by age and race, January 1957–September 1958**

Age <sup>1</sup>	White	Negro
All ages-----	100.0	100.0
Under 18-----	0.8	1.0
18-----	6.6	9.3
19-----	7.7	7.6
20-----	5.7	4.9
21-----	17.5	19.3
22-----	53.3	53.0
23-----	5.2	3.2
24-----	1.9	.9
25-----	1.2	.6
26-----	.1	.2
Mean age (years)-----	21.8	21.6

<sup>1</sup> As of last birthday.

SOURCE: Medical examination reports (Standard Form 88) of registrants examined for military service by the Armed Forces examining stations.

tween disqualified and inducted examinees within each race. Because of these differences, it was necessary, prior to combining the distributions, to ascertain that these groups are properly represented for analysis. This was done on the basis of monthly reports, Summary of Registrant Examinations for Induction (DA Form 316), submitted by each Armed Forces examining station in addition to the individual medical reports. From these monthly reports, the following ratios of disqualified to qualified registrants (excluding disqualifications for administrative, primarily moral, reasons) were established for this period of January 1957 through September 1958: White, 2,031 qualified and 1,000 disqualified; Negro, 555 qualified and 1,000 disqualified. The examinees disqualified for administrative reasons were excluded because no medical data are available for most of them.

The ratios of inductees to those disqualified in our study were obviously different from the ratios derived from the monthly reports. These differences stem from the fact that the medical reports of qualified registrants are received only for those who are inducted. Certain numbers of those who qualify enlist prior to induction; others may not be called up at all. The medical reports of these qualified registrants are not available. Hence, it was

requirements. There are three grades to this profiling, ranging from grade 1, the highest, to grade 3, the lowest. A general discussion of profiling is presented by the author in another article (7). During this period, grade 1, for instance, required correctable vision of 20/20 in one eye and 20/30 in the other eye. By these various profiling visual standards, the Army regulations thus provided for recording the highest possible correctable distant vision. Toward this end, each Armed Forces examining station has been equipped with a large trial lens-set. However, there might have been cases, especially if the minimum visual requirements were met, in which the medical examiner could have recorded the distant vision, as corrected by the examinee's own glasses, as correctable vision, without further testing. This could have led in some cases to understating correctability. Notwithstanding this fact, the correctable vision as recorded on the medical examination reports may, by and large, be taken as a reliable index of potential correctability.

In combining the cross-tabulations of uncorrected by correctable distant vision of the disqualified examinees with those of the inducted examinees for the purpose of obtaining corresponding distributions relating to the total examinees, the tabulations were weighted in the same manner as the cross-tabulations of uncorrected distant vision by right and left eyes. From the combined cross-tabulations of uncorrected versus correctable distant vision, probabilities of correctability were initially computed separately for the right and left eyes. A statistical evaluation of these separate probabilities indicated no significant differences between them. In other words, there is an equal chance for a specified defective vision to be corrected to a specified better vision, irrespective of whether it is that of the right or left eye. The probabilities of correctability (table 4) were hence computed by combining the weighted cross-tabulations of uncorrected versus correctable vision of the right eye with those of the left eye. These probabilities are presented sep-

**Table 4. Probabilities of correctability of a given distant vision to a given correctable distant vision, but not better, by race, January 1957-September 1958**

Best correctable distant vision <sup>1</sup>	Uncorrected distant vision						
	20/40	20/50	20/70	20/100	20/200	20/400	<20/400
<i>White</i>							
20/20	0.686	0.590	0.611	0.595	0.610	0.578	0.322
20/30	.270	.296	.235	.217	.199	.232	.223
20/40	.044	.079	.087	.092	.072	.066	.089
20/50		.035	.032	.030	.024	.020	.036
20/70			.035	.040	.030	.026	.036
20/100				.026	.029	.017	.021
20/200					.036	.025	.026
20/400						.036	.024
<20/100							.223
Total	1.000	1.000	1.000	1.000	1.000	1.000	1.000
<i>Negro</i>							
20/20	.636	.450	.501	.490	.497	.385	.088
20/30	.309	.371	.271	.205	.172	.221	.119
20/40	.055	.115	.124	.145	.113	.109	.104
20/50		.064	.018	.039	.033	.011	.049
20/70			.056	.059	.062	.047	.033
20/100				.062	.054	.050	.035
20/200					.069	.079	.040
20/400						.065	.010
<20/100							.492
Total	1.000	1.000	1.000	1.000	1.000	1.000	1.000

<sup>1</sup> Snellen notation.

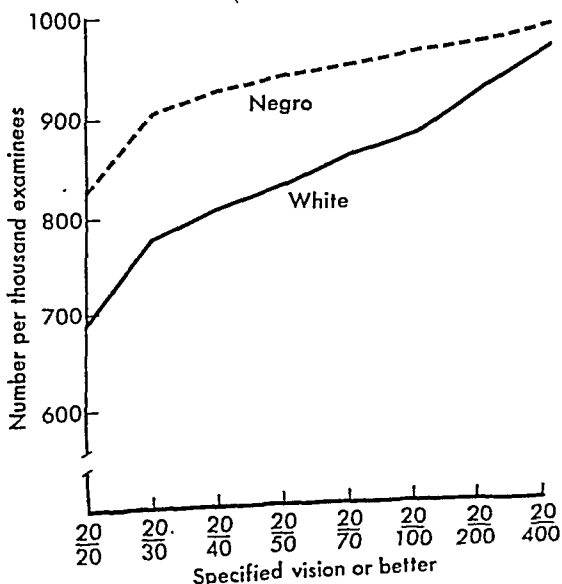
SOURCE: Medical examination reports (Standard Form 88) of registrants examined for military service by Armed Forces examining stations.

with 82 percent of the Negro examinees. This fact of comparatively poorer vision of the white examinees is more distinctly shown in table 3 and figure 1, derived from table 2.

Uncorrected vision of less than 20/40 is ordinarily taken as point of departure to indicate defective vision. Table 3 shows that 81 percent of the white examinees had 20/40 vision or better in each eye, or 87 percent had such vision or better in at least one eye. The corresponding data for the Negro examinees indicate 93 percent having 20/40 vision or better in each eye, and 96 percent having such vision or better at least in one eye. In other words, 19 percent of the white examinees had less than 20/40 vision in the worse eye, or 13 percent in the better eye. Of the Negro examinees, only 7 and 4 percent had less than 20/40 vision in the worse or better eye, respectively.

Similar differences by race have been indicated by previous studies (2-4). The first (2), relating to low-income farm families, revealed such differences for each age group, within the age range from 5 to 65 years and over. These findings seemed to suggest that these differences could be primarily genetic (or racial) in origin. On the other hand, there are indirect

**Uncorrected distant vision, both eyes, in registrants examined for military service, by race, January 1957-September 1958**



**Table 3. Distribution of registrants examined for military service by specified uncorrected distant vision or better, by race, January 1957-September 1958**

Snellen notation	Number per 1,000 examinees <sup>1</sup>			
	In each eye		At least in one eye	
	White	Negro	White	Negro
20/20 or better.....	693	822	780	888
20/30 or better.....	784	904	850	947
20/40 or better.....	814	927	874	962
20/50 or better.....	833	941	889	969
20/70 or better.....	863	956	910	978
20/100 or better.....	888	966	929	984
20/200 or better.....	932	979	961	993
20/400 or better.....	971	989	994	993

<sup>1</sup> Derived from table 2.

indications that these differences may be environmental in origin. Studies of inductees (5,6) indicate a certain association between mental group and defective vision. It seems that the higher the mental group, the larger the relative proportion of individuals with defective vision. (These studies indicated for the higher mental groups I and II, as determined by the Armed Forces Qualification Test, proportionally more in physical categories B and C, which consist principally of inductees with defective vision.) All in all, however, it still remains an open question whether these racial differences in visual acuity are genetic in origin, or are the results of later environmental development, or are due to both.

### Correctability Potentials

The visual standards of this period have been expressed in terms of both uncorrected and correctable vision. With respect to correctable vision, the minimum visual requirements for acceptance into military service were correctable vision of 20/40 in one eye and 20/70 in the other eye, 20/30 in one eye and 20/100 in the other eye, or 20/20 in one eye and 20/400 in the other eye (1).

In addition to these minimum requirements, standards of correctable vision have been also established for profiling (grading) those whose correctable distant vision is above the minimum

# Experimental Biology

**D**URING the 44th annual meeting of the Federation of American Societies for Experimental Biology, more than 2,600 papers were presented in a 5-day session at Chicago, April 11-15, 1960. Of this number, a few are mentioned below.

Abstracts of most of the papers were made available before the meeting by the society, which employed an electronic computer to place the papers in order in the book and to compose an index with cross references in 261 categories of the contents. Funds for this experiment were provided by the National Science Foundation.

The computer also scheduled the program to assure a minimum of conflicts, and to take into account the size and location of meeting rooms. It made possible for the first time a plan to define and analyze subjects of greatest interest to members.

## Toxins

Public health measures to deal with environmental wastes, with manmade chemicals, and with the safety of food and water, stated H. F.

Smyth, Jr., of Mellon Institute, will lean heavily on information developed by disciplined experimental studies by toxicologists.

A special challenge to toxicology mentioned by Dr. Herbert Stokinger of the Public Health Service is posed by environmental poisons which are too inconspicuous to be measured or even to be identified but which nevertheless damage persons chronically exposed. The slow emergence of effects such as cancer, he added, makes it difficult to associate them with the cause. The long-term effects of low doses of radiation were mentioned by Dr. Charles Dunham, Atomic Energy Commission, as another example.

A challenge cited by Dr. A. J. Lehman of the Food and Drug Administration is the abnormal sensitivity of a small fraction of the population to medication which may be suitable for the majority. Animal trials, for the present, he said, give little or no indication of the presence of such a hazard.

A clue to the resistance of some strains of *Staphylococcus aureus* to penicillin was reported by Harry Steinman, Public Health Service, who suggests that the antibiotic stimu-

arately by race. More details with respect to the interpretation of these probabilities are given in another paper by the author (8).

While the analysis of the uncorrected vision by race clearly indicated much better vision for the Negro examinees, the probabilities of correctability point curiously in the opposite direction. For instance, for white examinees, the column labeled 20/100 uncorrected vision (table 4) indicates that the probability of having this vision corrected to as high as 20/20 is 0.595; to not better than 20/30, 0.217; to not better than 20/40, 0.092, and so forth. In other words, one may expect that 59.5 percent of the white examinees having 20/100 uncorrected distant vision are likely to have their vision corrected to as high as 20/20; 21.7 percent, to not better than 20/30; and 9.2 percent, to not better than 20/40. Altogether, 90.4 percent of the white examinees with 20/100 uncorrected vision can expect to have their vision corrected to 20/40 or better. The remainder, 9.6 percent, cannot expect to have their 20/100 vision corrected to as high as 20/40.

For Negro examinees, the column labeled 20/100 distant vision shows that 49.0 percent of them may be expected to have their vision corrected to as high as 20/20; 20.5 percent, to not better than 20/30, and 14.5 percent, to not better than 20/40. Altogether 64.0 percent of the Negro youths with 20/100 uncorrected distant vision may be expected to have their vision corrected to not better than 20/40, a manifestly lower percentage than for white examinees.

Analogous lower probabilities of correctability are indicated for Negro examinees by each column of table 4. As far as could be determined, this finding is not known to the literature. Our data provide no clue as to the cause of these differentials.

### Summary

This study deals with uncorrected and correctable distant vision of Selective Service registrants examined for military service during the 21-month period from January 1957 through September 1958.

The data were abstracted from the medical examination reports (Standard Form 88) of the examinees. It was a sample (50 percent) study comprising some 273,000 reports.

The analysis was carried out by race, involving some 222,000 medical reports of white (denoting non-Negro) examinees, and 51,000 such reports of Negro examinees.

The mean ages (as of last birthday) of these examinees were computed as 21.8 years for the white and 21.6 years for the Negro examinees. Most of the examinees (71 percent of the white and 72 percent of the Negro examinees) were within the 21- to 22-year age group.

Better vision for the Negro than for white examinees was found. For instance, 82 percent of the Negro examinees had 20/20 uncorrected bilateral vision, as compared with 69 percent of the white examinees. On the other hand, the probabilities of correctability of poorer to better vision were lower for the Negro than for the white examinees. For instance, it may be expected that 60 percent of the white youths having uncorrected distant vision of 20/100 could have their vision corrected to as high as 20/20, while the corresponding percentage for the Negro youths is 49. Lower probabilities of correctability were found for the Negro youths in each of the visual readings of 20/40 and lower.

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By tracing radioactive fats, Donald Berkowitz and colleagues at Hahnemann Medical College, Philadelphia, found indications that fat tolerance rather than cholesterol is critical to the prevention and control of atherosclerosis.

Another oil which lowers the level of cholesterol in the blood has been developed in highly concentrated form by Martin Nothman and Samuel Proger of the Pratt Clinic New England Center Hospital, Boston. Known as arachidonic acid, it appears to be more effective than linoleic acid or linolenic acid, though difficult to produce.

A relatively common source of unsaturated fat, the avocado, was used by Wilson C. Grant, Veterans Administration Hospital, Coral Gables, Fla., experimentally to reduce serum cholesterol, with significant results in one-half the patients observed.

Association of a microbe of the order Actinomycetales with destruction of elasticity of arterial walls was reported by Anthony J. Sbarra and colleagues of St. Margaret's Hospital, Tufts University Medical School, Boston.

### WHO Fellowships for U.S. Citizens

February 1, 1961, is the deadline for a limited number of short-term fellowships in public health and allied fields, to be awarded by the World Health Organization to full-time public health and educational workers from the United States.

Applications are submitted to the WHO Fellowship Selection Committee set up in 1959 by Surgeon General Burney. One criterion for selection will be the importance of the individual's contribution on his return, attributable to the foreign study. Employees of the United States Government are not eligible.

The fellowships cover per diem and transportation and ordinarily are limited to short-term travel, for 2 to 4 months. Employers are expected to endorse applications and continue salaries during the fellowships. Successful applicants probably can not start their fellowships before May 1, 1961.

Further information and application forms are available from Dr. Howard M. Kline, Secretary, World Health Organization Fellowship Selection Committee, Public Health Service, Washington 25, D.C.

## *Spotlight on Rescue Breathing*

The educational program in rescue breathing conducted by the Erie County (N.Y.) Health Department demonstrates how an opportunity for leadership may be developed in a single aspect of a well-rounded campaign.

In its broad accident prevention program, the county health department had decided to concentrate on a few selected problems. Subsequently, a special advisory committee to the commissioner, mindful of the county's geographic position, pinpointed water safety for emphasis. Further consideration focused interest on lifesaving techniques, specifically the relatively new method of rescue breathing.

Most medical and safety groups had endorsed the method, and medical journals had given it attention for several years, but popular knowledge and acceptance were relatively meager. The Erie County Health Department decided that it had the responsibility of promoting this method of artificial respiration.

At that time, much of the research on the method was being carried out at the Roswell Park Memorial Institute. Parallel local efforts included the setting up by the county medical society of a special subcommittee on rescue breathing that reached professional and special interest groups. An extensive program for the city and county high schools was also underway. Consequently, the health department's main responsibility in the program was to reach the general public.

An exhibit was designed and constructed by the department's office of public health education, mainly to delineate the mouth-to-mouth or mouth-to-nose technique of rescue breathing. Entitled "Your Breath Can Save a Life," one element of the exhibit depicts the essentials of rescue breathing through use of flashing colored transparencies. Another panel lists the advantages of this method and the authoritative groups endorsing it. Two life-sized mannequin heads, in a shadowbox, move in synchronized rhythm to depict the rescuer and

victim. Schematic drawings with detailed instructions supplement other literature, including a wallet-sized card on which the method is outlined (see the January 1960 issue of *Public Health Reports*, p. 45). Personnel of the health department were trained to demonstrate the technique and to man the exhibit.

The exhibit was put on public display first in August 1959 at the Erie County Fair. Most of the 30,000 fairgoers who passed through the health building stopped long enough to watch the entire demonstration and ask questions. In addition, many requested programs for their organizations. Next, the exhibit appeared in the lobby of Buffalo's City Hall, where again interest was high.

At the October 1959 meeting of the American Public Health Association, the exhibit was awarded a certificate of merit from the association's scientific health committee. A continuous circuit at advantageous locations is planned.

Concurrently, other activities were undertaken to round out the project. Several television programs with live demonstrations have been arranged and special news releases are issued continually. A training film, "Rescue Breathing," which was purchased by the department, is shown together with a demonstration to any interested group. Also, inservice training sessions are held for all department personnel. Future efforts will be directed toward intensifying current activities.

No formal evaluation is contemplated to determine the extent of the program's effectiveness, but, based on close observation, certain conclusions seem valid. Rescue breathing as a lifesaving technique concerns and interests a broad section of the public. Even casual viewers can be given adequate instruction once their attention is captured and qualified attendants are present to clarify pictorial explanations.—  
RITA R. CHAZAN, M.P.H., director, office of public health education, Erie County Health Department, Buffalo, N.Y.

# Health Problems of the Navajos in Monument Valley, Utah

FRANK R. LEMON, M.D.

A SURVEY of the health status and some of the needs of the Navajos in Monument Valley, Utah, was initiated in 1956 by the department of preventive medicine, College of Medical Evangelists, and has continued intermittently until the present time. The Monument Valley Mission Clinic was headquarters for a preliminary investigation from 1956 through 1958, and the findings of that investigation are the subject of this report.

The objectives of the study were, first, to gather information relative to the age and sex distribution of the local population; second, to identify a few of the larger health problems; third, to obtain some concept of the rate of pregnancy and the degrees of childhood mortality; and fourth, to measure the reaction to tuberculin, histoplasmin, and coccidioidin.

The survey was conducted in three phases: (a) collection of demographic and illness data; (b) test inoculations with tuberculin, coccidioidin, and histoplasmin, and X-ray screening of a random sample of the population; and (c) reinoculation with coccidioidin and followup chest X-rays of those previously screened.

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*Dr. Lemon is associate professor of preventive medicine, School of Medicine, College of Medical Evangelists, Loma Linda and Los Angeles, Calif. This study was supported in part by the National Foundation through student fellowship grants to Alan King, Keith Mack, Donald Weaver, and John Ruffing, who collected many of the data.*

*Personnel of the Monument Valley Mission Clinic, including Dr. Paul Bringle, Dr. Lloyd Mason, and Mrs. Gwendolyn Walter, R.N., assisted in the fieldwork and provided valuable liaison with the Navajos and their leaders.*

The field studies were made during the summer months, June through September, of 1956, 1957, and 1958. This season is more suitable for travel by jeep, and most of the children are home from boarding school in the summer.

During the study, 1,140 individuals were identified in the families studied. Of these, 54 had had illnesses or injuries resulting in hospitalization during the previous year. One-fourth of these admissions were for tuberculosis. This does not include an undetermined number who died from illness or injury prior to hospitalization.

## Study Area

The Navajo reservation occupies approximately 25,000 square miles in the northeast corner of Arizona and portions of two adjacent States. An estimated 75,000 Navajos lived on the reservation in 1958 (1a). Traditionally, the sustenance of the Navajos has been obtained from sheep raising and summer gardening, chiefly corn, in the scattered valleys, where some water is available. The economic status of the tribe has recently been elevated and their pattern of living changed somewhat by the development of oil, uranium, and other mineral deposits on the reservation. However, in many areas, they continue the nomadic life of past centuries (2, 3).

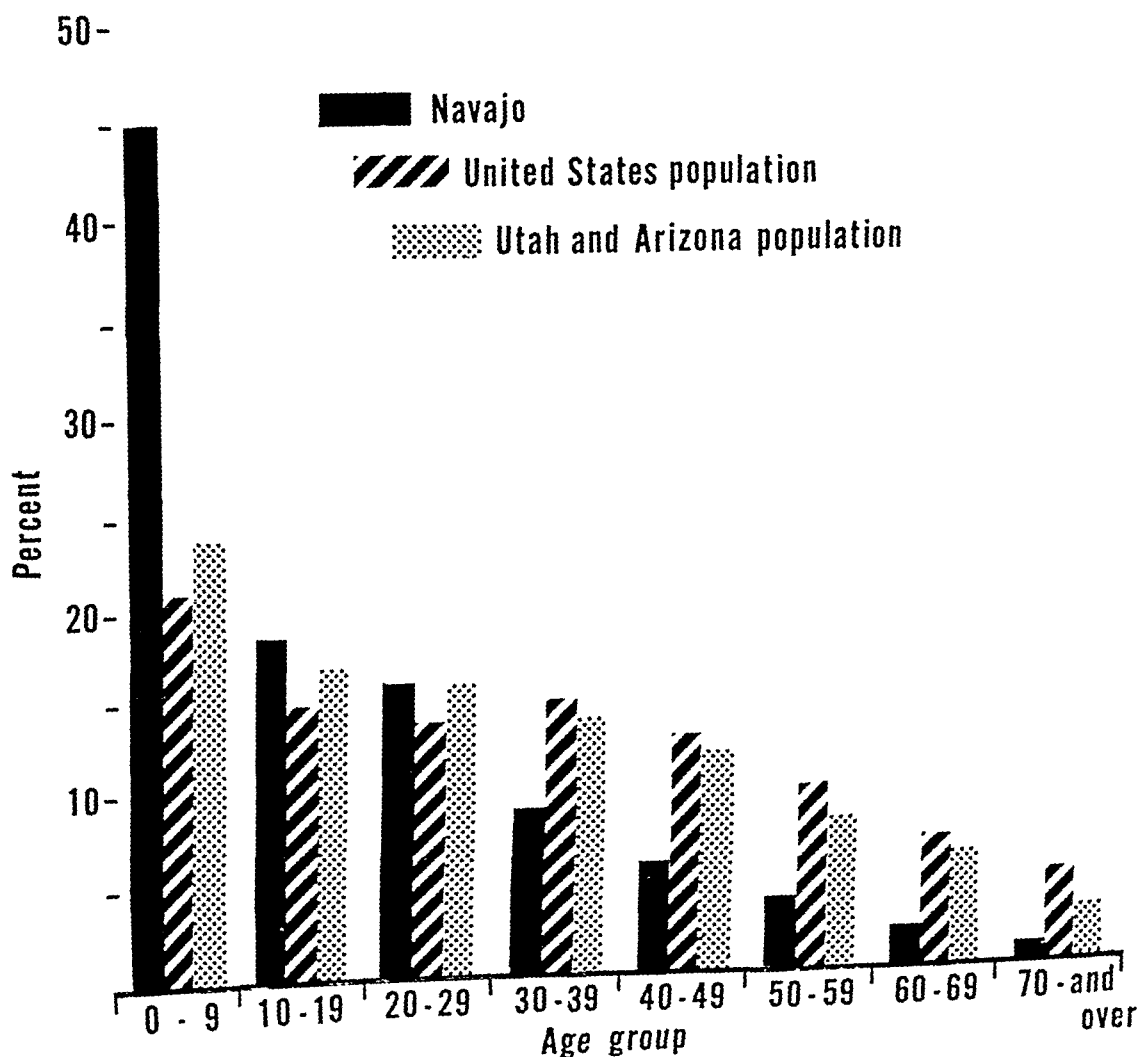
Monument Valley is 55 to 60 miles west of the "four corners" junction of the State borders of Utah, Arizona, Colorado, and New Mexico. The area of the present study is centered where Utah State Highway 47 crosses the Utah-Arizona border and extends about 15 miles south and 25 miles in other directions, encom-

passing about 1,800 square miles. The region is characteristic of the southwestern "high desert" country. The altitude is approximately 5,200 feet. The terrain is marked by dramatically shaped and colored vertical red-rock "monuments" interspersed with arid, sage-covered range land. The valley is one of the more remote and primitive areas of the Navajo reservation, being separated by 100 miles of rough dirt road from the Government hospital at Tuba City, Ariz., and, during the study, by 72 miles of similar road from the town of Blanding, Utah. Distances to other major points south and east are greater, and much of the region is seldom-traversed wilderness.

In 1956 the Navajo population of this region was estimated at between 1,500 and 1,800 individuals, living in small family groups. A few were concentrated at various points near mines, ore-processing plants, or the two trading posts at Monument Valley and nearby Oljato. There was a small immigration of families into the area during 1956 and 1957.

Vital statistics pertaining to the Navajos are difficult to obtain. Their dispersed way of existence, the frequency with which they change their names or use several names, the occasional practice of polygamy, and the inconsistent reporting of births and deaths have combined with language and cultural barriers to obscure the

Age distribution of 1,140 Navajos, by decade, 1957



census and the measurement of health problems. Some estimates have indicated a population of low average age compared with the population of the United States (1, 2); others have indicated birth rates and childhood death rates of three to four times the national average (4). Tuberculosis is a major problem. Pneumonia, gastroenteritis, and other infections, including trachoma, are the principal causes of morbidity and mortality, along with accidents (4-7). With present knowledge, all of these diseases are largely preventable.

### Collection of Data

In 1956, assisted by interpreters, the investigators extended partial enumeration of Navajos from the vicinity of the clinic to progressively more distant perimeters. Data were collected in each family on the age, sex, and occupation of each member. Women of childbearing age were identified, as were members of the family who had died during the past year or who had suffered an illness or injury requiring hospitalization. More detailed inquiry was made of those persons reported to have such illnesses, injuries, or pregnancies. At the same time, clinic and hogan visits were tabulated to give an index of clinical problems. Of 468 consecutive visits, 178, or 38 percent, were pediatric in nature; 173, or 37 percent, general medical; and 55, or 12 percent, for routine dental complaints. The remainder involved both routine and emergency surgical and obstetrical care. The preponderance of general medical and pediatric contacts indicates an opportunity for health education and preventive medicine.

### Age and Sex Distribution

The age distribution of the 1,140 Navajos identified is notable when compared with the populations of the entire United States, or the States of Arizona and Utah (see chart), or the total Navajo population. Seven hundred and twenty-one (63 percent) were under 20 years of age. This age group was estimated at 57 percent of the total Navajo population in 1950 (1a). The marked shift toward the younger ages is represented by the extremes. Children aged 0-9 years comprised 45 percent of the Navajo population in the study area, or an esti-

imated 34.6 percent of the total Navajo population in 1957 (1b), compared with 21 percent in the United States as a whole and 24 percent in the Arizona-Utah population. Those 50 years of age and older comprised only 6 percent of this Navajo group in contrast to 22 percent in the United States and 17 percent in the Arizona-Utah population.

The sex distribution of the study group was 574 male and 566 female, of whom 419 (37 percent) were 20 years of age or older. There were 20 married women under age 20.

Of 234 employed or employable men in the families studied, 78 percent were engaged in mining, sheepherding, and construction, 4.7 percent were storekeepers or medicine men or were retired, and 17.3 percent were engaged in miscellaneous occupations.

### Pregnancy and Childhood Mortality

Information provided by 175 Navajo mothers in the childbearing ages 17-49 years revealed a high pregnancy rate. Of these mothers, 142, or 81 percent, reported a pregnancy on an average of at least every 2 years (table 1). More than one-third averaged a pregnancy yearly. An annual pregnancy was common up to age 29, and an average of one pregnancy at least every 2 years up to age 39. Fifty-five percent had had five or more pregnancies; nearly one-third, more than seven. These women reported 857 live births and 38 pregnancies ending in fetal death, a ratio of 22.6 to 1. In the continental United States in 1957, the ratio of registered live births to fetal deaths was 45.9 to 1 (8, 9).

We believe that among the Navajos there was a cultural reticence to report, and probably a failure to recall, stillbirths or abortions. We know of no exactly comparable data concerning the average frequency of pregnancies among women of the United States. A report on child spacing published in 1958 (10) indicated that among a group of 66,930 women in the United States aged 15-44 years, there were 26,438 (39.5 percent) of various or no parity whose marriage or last live birth had been within a 2-year interval. Twenty-two percent of these had a live birth within that 2-year interval; 17 percent had a live birth within 1 year after marriage or after a previous birth.

The frequency of childhood mortality is indicated by the report of 73 of 175 mothers that they had lost one or more children after birth (table 2). The most common causes of death, on the basis of descriptive information provided by clinic records or by the parents, were respiratory, gastrointestinal, and central nervous system infections, and injury.

Of 146 childhood deaths among 857 live births from 1927 to 1956, 108 occurred during infancy (table 2). A crude comparison of the death rate among Navajo infants with the United States infant death rate is made on the basis of these 108 deaths. Of all newborns reported by mothers in the study group, 12.6 percent died during infancy. This represents an average infant death rate for each of these 30 years which may have been more or less than 126 per 1,000.

The decline in infant mortality in the United States during the period 1927-56 was virtually a straight-line fall (11, fig. 1). Therefore, it is possible to estimate an average rate for this period which is nearly a correct summation for the entire 30 years' experience. At the midpoint of this period the infant mortality rate in the United States was between 40.4 in 1942 and 45.3 in 1941 (12), an average of about 42 per 1,000, or 4.2 percent of all newborns. Thus, infant mortality reported by these Navajo mothers during the period 1927-56 appears to be about three times the rate for the United States.

The data on pregnancy and childhood mortality among the Navajos suggest, in a population that is young compared with the

**Table 2. Deaths among offspring<sup>1</sup> of 73 of 175 Navajo mothers in Monument Valley, Utah, 1927-56, by age group**

Age at death (years)	Number	Percent	Common causes of death
0-1-----	108	74	Respiratory, gastrointestinal, meningeal, and secondary infections following childhood diseases.
Died before 1950.	68	47	
Died 1950 and after.	40	27	
2-9-----	32	22	Injuries.
10 and over-----	6	4	
Total-----	146	100	

<sup>1</sup> Majority born since 1930.

surrounding white population, a probable high birth rate, with an associated high rate of infant and childhood mortality. The data are insufficient, however, to give current birth and infant death rates precisely. It was our impression that, with the increased availability and use of health services in the area since 1950, there has been a decline in infant mortality.

#### Inoculations and X-rays

During 1956 and 1957 nearly 1,000 individuals were tested for their reactions to one or more intermediate strength tuberculin, histoplasmin, and coccidioidin (tables 3 and 4).

In 1956, intermediate strength tuberculin was administered intradermally to a random selection of Navajos aged 29 and under. In 1957, additional test inoculations with tuberculin,

**Table 1. Pregnancy experience of 175 Navajo mothers<sup>1</sup> aged 17-49 years, Monument Valley, Utah**

Average interval between pregnancies (years)	Total		Age group (years)							
			15-19		20-29		30-39		40-49	
	Number	Percent	Number	Percent	Number	Percent	Number	Percent	Number	Percent
1-----	65	37.0	12	19.0	47	72.0	4	6.0	2	3.0
2-----	77	44.0	1	1.0	32	42.0	35	45.0	9	12.0
3-----	17	10.0	0	0	4	24.0	4	24.0	9	32.0
4 or more-----	16	9.0	0	0	3	19.0	7	43.0	6	38.0
Total-----	175	100.0	13	7.4	86	49.1	50	28.6	26	14.9

<sup>1</sup> Based on 175 "married" women ages 17-49 in hogans and camps surveyed.

**Table 3. Reactions to 378 histoplasmin and 492 coccidioidin skin tests among Navajo Indians in Monument Valley, Utah, by age group, 1957**

Age (years)	Antigen			
	Histoplasmin <sup>1</sup>		Coccidioidin <sup>2</sup>	
	Positive	Negative	Positive	Negative
0-19-----	2	232	11	312
20 and over----	3	121	9	145
Unknown-----	0	20	3	12
Total----	5	373	23	469

<sup>1</sup> Equivalent to NIH reference histoplasmin.

<sup>2</sup> Cutter 1:1,000 dilution, biologically standardized.

coccidioidin, and histoplasmin were performed among a random sample of the total study population. At the same time, this sample was subjected to a screening X-ray of the chest, usually provided by a mobile unit of the Public Health Service, with technical and consultative assistance from officers of the Service's Division of Indian Health. Radiographs were read by Dr. Paul Deeb, department of radiology, School of Medicine, College of Medical Evangelists. Of those variously skin tested, 32 had abnormal pulmonary findings (table 5), and of these 27 were tuberculin positive, 2 were coccidioidin positive, and none of 15 was his-

toplasmin reactive. These data suggest that persistent inflammatory, calcified, or fibrotic lesions of the lungs in Navajos in this area are most likely due to tubercular infection. However, the possibility of endemic coccidioidomycosis is suggested.

Of the 967 persons tuberculin tested in 1957, 229, or 23.7 percent, reacted positively (table 4). It is surprising to find only 8.2 percent positive among children 14 years of age and under. Other investigators have reported as high as 22 to 33 percent positive reactions up to age 12 in other areas of the reservation (R. R. Omran, at the 1958 meeting of the American Public Health Association, and personal communication from Dr. Kurt Dueschle). In April 1959, when 32 Navajo preschool and elementary school children aged 6-14 years were tested with tuberculin at Mexican Hat, Utah, at the northern perimeter of the Monument Valley study area, 2 reacted positively (personal communication from Dr. Lloyd Mason, July 1959).

Of the 967 persons tested with tuberculin, 158 were tested in both years, and of these 6 had converted to positive in the interval. In 1957, two of the 6 "converters" had an X-ray report of a suspicious inflammatory lesion of the lungs. Five of 378 persons tested with histoplasmin were positive (table 3), and of these none revealed any significant findings on chest X-ray. They may have been "false positives" following administration of antibiotics (13). Twenty-

**Table 4. Results of tuberculin tests <sup>1</sup> on 967 Navajos in Monument Valley, Utah, 1956 and 1957**

Age group (years)	Total tested	Reaction				
		Positive			Negative	
		Number	Percent	Cumulative percent	Number	Percent
0-4-----	301	6	2.0	2.0	295	98.0
5-9-----	252	23	9.1	5.2	229	90.9
10-14-----	130	27	20.8	8.2	103	79.2
15-19-----	81	31	38.3	11.4	50	61.7
20-29-----	76	49	64.5	16.2	27	35.5
30-49-----	61	46	75.4	20.2	15	24.6
50 and over----	47	41	87.2	23.5	6	12.8
Unknown-----	19	6	31.6	23.7	13	68.4
Total-----	967	229	23.7	23.7	738	76.3

<sup>1</sup> Parke-Davis P.P.D. 0.0001 mg. in 0.1 ml.



Table 5. Skin test reaction of 32 of 44 Navajos with positive chest X-rays, Monument Valley, Utah, 1957

X-ray diagnosis	Number X-rayed	Number skin tested	Reaction					
			Tuberculin		Histoplasmin <sup>1</sup>		Coccidioidin <sup>1</sup>	
			Positive	Negative	Positive	Negative	Positive	Negative
Acute lesion.....	6	4	2	2	0	3	0	4
Calcified pulmonary lesion.....	17	10	8	2	0	3	1	8
Calcified secondary lesion.....	12	10	10	0	0	8	0	7
Fibrosis.....	9	8	7	1	0	1	1	7
Total.....	44	32	27	5	0	15	2	26

<sup>1</sup> Histoplasmin and coccidioidin tests were not done on all 32 patients who were tested with tuberculin.

three of 492 persons tested with coccidioidin were positive; half of them under 20 years of age (table 3). Of these 23 individuals, 2 had suspicious X-ray findings. These were suggestive of a calcified "primary" lesion of the lung in one instance and of "fibrosis" of a portion of the lung field in the other. Of the 11 coccidioidin positive reactors under 20 years of age, 2 had been off the reservation in nearby areas of Arizona and New Mexico. Three had regularly lived farther than 50 miles south of Monument Valley. Six were local residents.

#### X-ray Followup

In 1958, a followup chest X-ray was made on 36 of 44 individuals whose 1957 X-rays had suggested acute or chronic inflammatory chest lesions. Two of these were reported to have "probable active pulmonary inflammatory disease"; four were suspected of having other intrathoracic pathology. One individual was located in a tuberculosis sanitarium, and two were reported as deceased, cause unknown. Twenty-seven were found to have no significant lesion on reexamination.

#### Discussion

The Navajo way of life is in many ways foreign to life outside the reservation. Health practices and attitudes continue to be influenced by ancient cultural concepts, although some of these concepts are modified as the Navajo is

regularly exposed to the "white man's medicine" and to his ideas of hygiene and sanitation. On the reservation, considerable variation in morbidity and mortality experience probably exists between different areas with differing availability of health services.

The pattern of a predominantly young population, exhibiting evidence of a high birth rate and a high infant death rate appears to be true in Monument Valley as other investigators have estimated it to be in other areas of the Navajo reservation. However, the difficulty of obtaining precise data inhibits broad interpretation of our findings.

Because of their way of life, insanitary practices, and the distances to medical facilities, it is not surprising that morbidity and mortality from infectious diseases continue to be major problems among the Navajos. The challenge to health workers is to seek correction of those factors which predispose these people to preventable disease.

Although tuberculosis may be a special problem for the Navajo on a racial basis, it would be of interest to compare data concerning this infection among those living on the reservation with similar data for those living in the environmental conditions and by the standards of the surrounding white population.

#### Summary

The somewhat isolated group of Navajos in the Monument Valley area of Utah is made up

of a predominantly young population with an apparently high birth rate and a high childhood death rate. Major disease problems of the area include tuberculosis and other respiratory, gastroenteric, and miscellaneous infections. Of 967 individuals tuberculin tested, 229 were found to be positive, whereas of 378 tested with histoplasmin, only 5 were positive, and of 492 tested with coccidioidin, only 23 were found positive. It is believed that a crude baseline for the health status of Navajos in the region has been ascertained. Further study is contemplated to define more precisely the nature of these and other health problems.

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# Training Health Administrators

ROBERT J. MOWITZ, Ph.D.

**S**HORTLY after World War II, leaders in the National Tuberculosis Association reviewed current and future personnel needs and came to the conclusion that within a few years many key executives in State and local affiliates would soon be lost because of death or retirement. This inventory led to the conclusion that, in order to avoid a crisis resulting from a shortage of professionally trained personnel for executive positions, it would be necessary to take some positive steps. The steps taken culminated in the establishment of a graduate training program in health administration at Wayne State University, Detroit, Mich.

There was much discussion in public health circles during this period concerning the proper role and training of nonmedical administrators. The need for such personnel was well recognized, but the role to be played, especially in official health agencies, was vague. Formal training, with the exception of hospital administrator programs, had not as yet been institutionalized. This state of affairs was revealed in the "Proposed Report on Educational and Experience Qualifications of Administrative Personnel (Non-Medical) in Public Health Agencies" that appeared in the *American Journal of Public Health* in April 1951. The report asserted that: "The basic preparation of a non-

medical administrator in public health agencies should give him an awareness of the social setting and biological basis of health work and training in the role and organization of administration." This generalization is a succinct statement of the general policy followed some 3 years earlier in organizing the Wayne program.

Since the position of executive secretary in a voluntary health agency had traditionally been held by a lay person and since no particular professional group had ever dominated these positions, it was possible to design a training program for potential executive secretaries with a remarkable degree of freedom. The committee which met in Detroit in the fall of 1948 to consider such a design included among its members two medical health officers, a professor of health education from a school of public health, and personnel from NTA and the university. The committee's decision to develop a curriculum combining training in the art and science of administration with substantive training in health was later echoed in a report of a committee of the American Public Health Association. Within this general framework, the committee further decided that the responsibilities of the positions to be filled required a degree of maturity and sophistication that could only be achieved through graduate training; that the core of the curriculum should be training in administration, with the health content provided, for the most part, through the use of outstanding public health practitioners and teachers as guest lecturers and through field training; that the principal criteria for admission should be a sincere interest in serving the public and a demonstrated capacity to do quality graduate work; and that fellowships should be offered in order to attract the best possible candidates.

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*Dr. Mowitz is professor of political science, Wayne State University, Detroit, Mich. The National Tuberculosis Association supplied basic financial support for the 9 years' experience in training public health administrators described, through annual grants to the university and the establishment of a number of fellowships each year. Fellowships have been provided also by the National Society for Crippled Children and Adults and the American Cancer Society.*

Using the guidelines developed by the committee, the details were worked out, and with the support of NTA, the program got underway with two students in January 1949. In September 1949, it was established as a full-time 12-month program, including two semesters of course work and a summer of field training, and eight additional students were enrolled. By September 1958, 58 fellowship students had completed the training. Since this has been a rather unique experiment in training for the health profession, a brief review of the past 9 years' experience should be of interest.

One characteristic of the Wayne program that seems to result in an occasional raised eyebrow in public health circles is its location as part of a public administration curriculum. This may be due in part to a misconception of the public administration discipline. Or in part it may be due to a feeling that all training for public health positions should be confined to schools of public health, a position avoided in the APHA report referred to above but still in existence and detectable to even the casual observer. To argue the point is not the purpose of this article. But it is appropriate to point out that the public administration discipline is reaching a point of development wherein training in its art and science is rapidly becoming indispensable to anyone holding a position of responsibility in any organization claiming to serve the public interest. Errors that at an earlier time could be excused as the necessary cost of a trial-and-error approach to administration become inexcusable with the availability of knowledge and skills to avoid such errors. It would seem to make sense, then, to use the content of public administration as a base upon which to build the health administrator's training. Certainly in 1948 it seemed to be worth a try, and it was appropriate for a voluntary agency with a tradition for experimentation to spur the effort.

#### **Program Format**

A curriculum problem during the past 9 years has been to keep abreast of the dynamic changes occurring in both the health and public administration fields. Social science research is producing findings that provide the basic input of

facts with which the student of administration must deal. These include the psychologists' findings in relation to motivation, perception, and learning on the one hand and, on the other hand, experimentation in the use of mathematical models to solve program problems through the use of operations research techniques. A current course in the curriculum deals with the relationship of a bureaucracy to the policymaking process in a pluralistic power system. This course was not part of the curriculum 9 years ago. In addition there are courses in group dynamics and discussion and conference techniques.

But seminars have been the principal vehicle for keeping public administration subject matter abreast with current knowledge. It seems necessary to emphasize this point since it appears many still have the notion that the discipline of administration is confined to the study of formal organizational structure and administrative procedures. (The standard texts in "public health administration" tend to give this impression.) The point being made here is that the dimensions of the discipline increase as our knowledge about behavior in complex organizations and systems of organizations increases.

It is not necessary to elaborate on the changes in the health field during the past few years. For the most part, guest lecturers covered this part of the curriculum. During the past 9 years, well over 100 different speakers have participated. The large number is due in part to the shifting emphasis in public health problems in recent years and the need to bring in different specialists to deal with these subjects. At the same time it has been the policy to supply a wide variety of professional points of view in order to avoid a stereotyped approach to a dynamic area of study.

A core of eight guest lecturers participate each year, and it is around this core that the other lectures are scheduled. Although the temptation to engage in name dropping is almost irresistible at this point, suffice it to say that the lecturers are recruited from official health agencies (Federal, State, and local), schools of public health, colleges of medicine, voluntary health associations, and research foundations, to name only the major sources. Those who have participated in the guest lec-

ture system, either as teacher or student, know the difficulties involved in its use, but its justification lies in its ability to bring to a class a variety of skills and talent that cannot be duplicated on a single campus. The core eight who appear annually are strategically spaced throughout the year, and their familiarity with the program assists the course director in integrating the various lectures. Experience here would indicate that it takes at least 3 years to "shakedown" a guest lecture program into an effective teaching device and, of course, constant attention thereafter. Supplementing the guest lectures is concurrent and summer field training with official and voluntary agencies.

### Student Characteristics

The 58 fellowship students received their undergraduate degrees from 38 different colleges and universities distributed geographically in all sections of the United States. Most had undergraduate majors in one of the social sciences, with political science, sociology, and public administration the predominant fields. Three had majored in one of the physical sciences and one student had been in business administration. Although no particular undergraduate major has been required as a condition of admission, the organization of the program in conjunction with the public administration curriculum seems to have attracted the social science major. Experience has shown that there is no one best major, and there are decided advantages in having a group of students with a variety of undergraduate backgrounds.

Six students had had prior experience in voluntary health associations, and two left positions with official agencies to accept fellowships. For the remaining 50, the training was their first exposure to public health. Most of this group had been motivated to apply for the fellowship as a result of the advice of a faculty adviser, but a few had been self-motivated after reading printed material. The college professor has been the most effective recruiter for this program.

In comparing the performance of students who have had prior experience in public health work with those who have not, it would be diffi-

cult to make a good case for a program that would exclude either one of these categories. Certainly the student with experience contributes a good deal to his inexperienced colleagues, but the student fresh out of college has usually developed the good study habits and concern for scholarly detail in fulfilling assignments that help keep the training at that level of sophistication commensurate with graduate study. In addition, there is the virtue of introducing new blood into the field through recruiting the college graduate directly into professional training.

All but five of the students have been men, all but six of whom had some prior military service. The only significance of this latter fact is that it indicates that most of the men were in their middle twenties and, having fulfilled their military obligations, were able to accept a full-time position at the completion of their training.

### Placements

One of the issues discussed by the planning committee in 1948 involved the possibility that students with sound training as administrative generalists would desert the health field. If transferable skills were to be taught, why couldn't they be transferred to any other field? It was felt that this was a risk worth taking, but the ghost of this issue continues to haunt this and other health training programs. The insistence by many that public health experience should precede postgraduate training is another manifestation of this compulsion to prevent personnel from escaping the field. There are obvious reasons for this point of view. Subsidized training, whether in the form of fellowships or other means, is expensive, and, too, there are the strong feelings of those who are sincerely committed to a particular field of endeavor and who have a tendency to question the motives of those who do not share their zeal.

On sober reflection, however, most would agree that in a free society it is the challenging nature of the position and the opportunity it provides to maximize values considered important to that society that will determine the outcome in the competition for personnel. It would be a disservice to society to erect barriers that would hold a person in a position demand-

ing only a portion of his talents and energy, to say nothing of the effect it would have on the individual so held. With these considerations in mind, it is of interest to review what has happened to the students after completing training.

Thirty-six graduates, a little more than 60 percent, are working in the health field. The majority of this group, 31, are employed by voluntary health agencies. Affiliates of the National Tuberculosis Association lead the list of employers, followed by the American Cancer Society. Also included among the employing agencies are affiliates of the American Heart Association, the National Society for Crippled Children and Adults, the Mental Health Association, and local health councils. The following indicates the types of positions held.

<i>Position</i>	<i>Number</i>
Executive secretary of State organization----	6
Executive secretary of local organization----	7
Member of national staff-----	3
Member of State staff-----	8
Member of local staff-----	7

The State and local staff positions include administrative assistant to the executive secretary, program director, field consultant, public relations director, and the like.

Of the remaining five who were counted as working in the health field, four are hospital administrators and the fifth is completing work leading to the degree of doctor of medicine. Two of the hospital administrators took additional academic training in hospital administration after leaving Wayne, but the other two did not. An applicant primarily interested in hospital administration is urged to apply to one of the schools with such a formal program, since Wayne is not designed for that purpose. But as can be seen, this does not prevent graduates from becoming hospital administrators, if they are so determined.

Of the 22 who are not working in the health field, 13 had been employed for a year or more in a health agency before leaving for other employment. This leaves 9 out of 58 who did not spend at least a year in the health field. Of the nine, three entered the armed services directly after their academic training, two accepted positions in the Federal civil service, three were employed by private business or in-

dustry, and one became a school teacher. A breakdown of the current positions held by this group of 22 shows 7 in private business or industry, 5 in public service (this includes 1 Marine career officer and 1 State legislator), 4 teachers (including 1 college instructor), 2 attending graduate school, 2 housewives, and 2 unknown.

In reviewing these data, it is interesting to note that none of the graduates is employed by official health agencies. During the initial discussions and on numerous subsequent occasions, health officers have commented that this program provides a type of training for which there is great demand among official health agencies. Former students have reported offers of positions in official agencies, but those who have remained in public health have remained with the voluntary agencies. The responsibility and prestige of those positions held with the voluntary agencies may be the reason. The opportunities for advancement and career development have been excellent for those willing and able to take advantage of them.

In addition to the fellowship students, six employees of official health agencies have been enrolled part time. Four completed the course requirements, and two are now enrolled. Two of these students are employed by a county health department and four by the Michigan Department of Health. All but one now hold positions of administrative responsibility, and their academic backgrounds vary from veterinary medicine to engineering. Although this is too small a group on which to base large conclusions, all have stated that the training was well worth the extraordinary effort required to keep up with both their jobs and academic responsibilities.

### Conclusion

An experimental graduate program for training health administrators will soon begin its 10th year of operation at Wayne State University. Sixty percent of its 58 graduates are now engaged in some variety of health work, most with voluntary health agencies. Curiously enough, 6 of the first 10 students now hold executive positions with health agencies, the same percentage as for the entire group. These data

ture system, either as teacher or student, know the difficulties involved in its use, but its justification lies in its ability to bring to a class a variety of skills and talent that cannot be duplicated on a single campus. The core eight who appear annually are strategically spaced throughout the year, and their familiarity with the program assists the course director in integrating the various lectures. Experience here would indicate that it takes at least 3 years to "shakedown" a guest lecture program into an effective teaching device and, of course, constant attention thereafter. Supplementing the guest lectures is concurrent and summer field training with official and voluntary agencies.

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# IDENTIFICATION OF STAPHYLOCOCCUS AUREUS

## IN A FOOD POISONING INCIDENT

William Prince, M.D.

Gilman K. Crowell, M.S.

ON FEBRUARY 15, 1959, a sudden, brief episode of acute gastroenteritis followed a winter carnival banquet served to approximately 180 persons representing the faculty, students, and guests of a private New Hampshire boarding school for boys in the secondary grades. Fruit cup with sherbet, rolls, roast beef with gravy, olives, celery, broccoli with hollandaise sauce, potatoes, and ice cream with fudge sauce were on the menu. Several boys in the infirmary and the school nurse also became ill after eating a meal delivered to them from the main kitchen.

On the evening of February 17, 2 days after the banquet, another outbreak occurred following a meal which included roast beef, leftover after the banquet, and baked ham as the meat dishes.

Records in the school infirmary indicated that similar incidents, although having a much lower attack rate, occurred on November 20, 1958, and on January 10, 1959.

The attack rate of the post-banquet outbreak of gastroenteritis was approximately 70 percent, with 14 percent admitted to the infirmary for treatment. All victims confined to their dormitories were supplied with medication.

Onset was characterized as sudden, with

severe abdominal cramps followed by nausea, vomiting, and profuse diarrhea. The incubation period varied from 2 to 4 hours. Acute symptoms subsided in most instances after 4 hours, with almost complete recovery in from 12 to 24 hours.

Physical examination revealed a low-grade fever up to 101.4° F. in most instances. Pulse was weak and thready but improved within an hour. There was no abdominal rigidity or localized tenderness. Blood counts and urinalyses were essentially normal. Food poisoning was indicated.

### Investigation

Upon questioning, it was found that the only food eaten on the night of the banquet by both the school nurse and her patients in the infirmary and the guests in the main diningroom was roast beef without gravy and broccoli without hollandaise sauce. It was also found that the students who ate leftover roast beef for the evening meal, February 17, became ill, while students who ate ham at this meal did not.

Following the banquet meal, food samples of leftover milk, hamburger which had been served at the noon meal preceding the banquet, roast beef, ice cream, chicken à la king served February 13 as the evening meal, onion soup, and chicken soup were collected in sterile containers for bacteriological study. Media used for isolation were selenite F broth, S.S.

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*Dr. Prince is director, bureau of communicable disease control, and Mr. Crowell is chief, bureau of food and chemistry, New Hampshire State Department of Health.*



indicate that the training has equipped the students for the type of responsibilities envisaged in the design of the program. This is not to imply that what has been described here is presented as a model for all comparable training.

On the contrary, the continuing critical shortage of qualified administrative personnel should encourage experimentation and improvement of current working models and at the same time stimulate the development of new models.

## Legal note . . . Sanitation: Sewer Rental Charges

Municipality's sewer rental charge based solely on amount of water intake held arbitrary where it refused to accept industrial waste from plant which discharged 95 percent of its intake into its own waste treatment plant or directly into a creek. Court required rental to be based on discharge into sewer system. *Borough of North East v. A Piece of Land, etc.* (159 A. 2d 528, Pa., April 1960).

In accordance with an ordinance of the Borough of North East, Pa., providing that the total annual sewer rental was to be equal to the total operating costs and be "equitably apportioned" among sewer users in proportion to the amount of water purchased from the Borough, the sewer rental charge was fixed at 20 percent of the water charge.

The Welch Grape Juice Company, Inc. (owner of the land against which the Borough was seeking to enforce a lien for sewer rental charges) purchases a considerable amount of water, 95 percent of which is used in its plant and ultimately discharged into its own treatment basin or directly into a creek. The company, having been refused permission by the Borough to discharge industrial waste into the sewer system, discharges into the Borough sewer system only the waste from its restrooms, cafeteria, and shower and drinking facilities, which constitutes about 5 percent of the water purchased. Other industrial plants in the Borough engaged in processing similar to defendant are, however, permitted to discharge their industrial waste into the system and are charged the standard rate. Welch was charged a sewer rental based on its total water purchases, which amount it refused to pay. When the municipality attempted to foreclose a lien for unpaid rentals, Welch challenged the charges as unreasonably disproportionate to the service rendered. The Borough contended that defendant should pay a sewer rental based on 20 percent of the total amount of water consumed, regardless of the use of the sewer system.

The Supreme Court of Pennsylvania, ruling

against the Borough, stated that in the construction, operation, and maintenance of a sewer system, a municipality engages in a proprietary function and is entitled to receive payment for the service rendered. The charge that is made for sewer service, however, must be based upon actual use, and must be reasonably proportional to the service rendered and not in excess of it. The court noted that the practical problem of determining the amount of use of the system by particular users has usually been resolved by relating the sewer charge to the amount of water provided to the property, which is apt to be roughly proportional to what flows out as sewage.

The court commented that if the Borough's contention were upheld—that the sewer rental charge is not related to sewer use—the charge would be in the nature of a tax rather than for service rendered, and it pointed out that sewer rentals were not taxes. The Borough's method of computing the sewage charge based upon total water consumption regardless of sewer use was held to result in an arbitrary, improper, inequitable, and unlawful charge, as was demonstrated by the fact that, while it refuses to accept industrial waste from Welch, it accepts the industrial waste of other industries, doing the same type of processing as Welch, at the standard rate. The court affirmed a lower court order fixing the charge on the basis of the amount of water which was reasonably found to have been discharged into the sewer system (5 percent of the intake).—SMNEY EDELMAN, assistant chief, Public Health Division, Office of General Counsel, Department of Health, Education, and Welfare.

# CHEMOTHERAPY

*a public health measure*

## AGAINST TUBERCULOSIS

EDWARD T. BLOMQUIST, M.D.

*Some considerations on how to act upon the major recommendation of the Arden House Conference on Tuberculosis.*

THE present status and future of tuberculosis control in this country was considered at the Arden House Conference on Tuberculosis held November 29–December 2, 1959. All of us closely involved felt at the time that it was an important conference, and the attention and consideration it has attracted offer proof that we were right. Many ideas and proposals have resulted from this conference, and there has been time for them to be examined critically. The ones that have survived are not revolutionary; they are practical, however, and this means a good deal.

The following thoughts have grown from many conversations, discussions, and even arguments on how the major recommendation of the Arden House Conference can be translated into action. I felt obligated to summarize my ideas this way since time is important. It seems to me imperative that suggestions on practical steps for carrying out the Arden House recommendations be advanced quickly, and to all interested in this field. If all of us concerned with tuberculosis in this country do not act quickly, a real opportunity will be lost. We must make the Arden House Conference produce something more than words and

justify the interest and enthusiasm it has engendered.

### The Present Situation

Since chemotherapy came into use, the death rate from tuberculosis has gone down sharply. Although the case rate has also been moving downward, it has apparently been affected less by the new drugs. The relatively slow decline of case rates can be accounted for in part by the large proportion of tuberculosis cases in the United States that result from the breakdown of old infections. At the present time no measure is available to prevent most of these, but more adequate treatment of all cases that do occur could prevent the cases that arise from recent exposure. In addition, it could prevent the new infections in those who would become the tuberculosis patients of the future or subjects for prophylactic treatment, if that becomes a reasonable measure. This, I believe, was the rationale back of the major recommendation made at Arden House.

Of course, to a great extent it is a reiteration of long-accepted principles. Casefinding, diagnosis, and treatment have been the basis of tuberculosis control for many years. But when treatment was a long, drawn-out course requiring months or years of bed rest, it was necessarily to a large extent the separate responsibility of

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*Dr. Blomquist is chief, Tuberculosis Branch, Division of Special Health Services, Public Health Service.*

agar, desoxycholate agar, 110 medium, mannitol-salt agar, and Colbeck Ey agar. All these sampled foods were negative for *Salmonella*. The roast beef, however, showed a heavy growth of *Staphylococcus aureus*.

The school kitchen appeared tidy and well organized. Dishes were machine washed at recommended pressure and temperature. The temperature in the walk-in refrigerator was maintained between 40° and 50°F. Seven employees worked in the kitchen, four men on a full-time basis and three women part time. This staff showed no visible evidence of skin lesions of infection and denied any infection or illnesses which could be related reasonably to the outbreak.

Cultures were taken from the throat and stool specimens of each member of the kitchen staff on four different occasions, at 3- to 4-week intervals. Results of these cultures showed consistently that six of the seven persons employed were positive for *S. aureus* in cultures from either or both throat and stool specimens. Cultures from stool specimens, taken from two ill students immediately following the banquet incident, were also positive.

All of the *S. aureus* cultures isolated from humans and food samples, when tested for coagulase reaction, were positive. Although the phage pattern of some of the cultures varied to a slight degree, all fell in the broad group 3 and were remarkably similar in their response to sensitivity tests. Throat and stool cultures of three of the seven employees in the kitchen as well as the stool cultures taken from the two ill students, exhibited an identical phage pattern ( $7+/42E\pm/73\pm$ ) to the culture isolated from the roast beef. The staphylococcus isolated from the roast beef, phage typed to group 3, was found to be enterotoxigenic using the cat injection test. All cats injected with this culture filtrate exhibited vomiting within 30 minutes to 3 hours after injection.

Tests of the swabbings taken at random in the kitchen showed heavy contamination of a coagulase-positive staphylococci on the meat slicer, the meat block, and the floor. Five of the ten swabbings showed coagulase-positive staphylococci.

## Discussion

It is assumed that the extensive "seeding" of the kitchen environment with staphylococci by the personnel who were carriers, coupled with unsatisfactory food handling, accounted for the repeated episodes of food poisoning at this school.

An inspection of the walk-in refrigerator showed many items of leftover food. It was apparent that the chef was not inclined to discard leftovers, preferring to keep them and serve them again at future meals.

It was also learned that it was the practice of the chef to cook all meats and other foods early in the morning of the day they were to be served, rewarming these foods just prior to serving the evening meal. Even when he was informed that this practice allowed an incubation period for food poisoning organisms, the chef was reluctant to change, since the time interval permitted the staff to enjoy an afternoon siesta.

After several educational conferences with school administrators stressing the necessity for proper handling and refrigeration of all foods, the chef was ordered to correct his practices or leave. The improper practices were corrected immediately.

The remedial measures suggested were aimed at prevention of food contamination and removal of its source from the staff and the kitchen environment. They included cleansing and sanitizing the walls, ceiling, and floors of the kitchen; cleansing and sanitizing all kitchen utensils and work surfaces; treatment of the six kitchen staff members with antibiotics based on sensitivity studies of the cultures of staphylococcus isolated from their throats and stools; and instruction of the staff in the proper handling of food.

This study is of particular interest because of the repeated occurrence of food poisoning outbreaks traceable, not to the usual boils or other infected skin lesions of human carriers, but to pathogenic staphylococci shed from the noses, throats, and gastrointestinal tracts of chronic carriers. This type of carrier is a potential community hazard in that he may be a source of infection to others.

ure. Casefinding for tuberculosis is public health activity, whether it is done by the health department or the tuberculosis association. To be sure, the health department has legal responsibility for tuberculosis control, but that does not mean it carries on all tuberculosis control activities in the community. Before any significant change in emphasis in this area can come about, there must be a change in the thinking and activities of many other agencies and individuals as well.

### Stages of Control

If we accept this interpretation of the major conference recommendation, what then can be done to carry it out? Certainly there will be wide variation in different areas, depending greatly upon the adequacy of present tuberculosis control programs, but the following general suggestions seem reasonable. For convenience, we can divide tuberculosis control as far as treatment is concerned into three stages: Stage 1, in which the community is not now able to provide adequate treatment for presently known active cases; stage 2, in which the program proposed for stage 1 is well underway; stage 3, in which programs for both previous stages are adequate.

*Stage 1.* In a community where any significant proportion of the patients with known active cases of tuberculosis are not receiving adequate treatment either in the hospital or at home, the first efforts should be to remedy that situation, by whatever means and using whatever resources the community has. Treatment would include the prophylactic administration of isoniazid to those groups of young children for whom its usefulness has been demonstrated. Casefinding should be deferred except for careful followup of all close contacts of persons known to have active disease and complete diagnosis of suspects among them.

*Stage 2.* If a high proportion, perhaps 75-80 percent, of persons known to have active disease are under treatment, and most contacts are being examined, casefinding should be extended, as resources are available, beyond the contact group to other high-incidence groups, but this should be done without taking staff time needed for treatment programs for active cases. The community is now in a posi-

tion to add to its treatment program the persons who have previously had active disease but are judged to have been inadequately treated. Prophylactic treatment for persons known to have recently converted from tuberculin negative to positive is also in order.

*Stage 3.* The community that has reached stage 3 presumably has found most of its active cases, and they are under adequate treatment. In addition, certain categories of inactive cases have been found and are being treated. It can then undertake to find and treat persons at especially high risk, such as tuberculin reactors with suspicious 14" by 17" chest X-rays or silicotics with large tuberculin reactions or X-ray changes, or both.

This proposal to consider tuberculosis control in three stages implies knowledge of the current status of tuberculosis cases. Details about what information should be gathered, and how records should be kept and data analyzed in order to have such knowledge, are not appropriate here, but the subject is of very great importance. Similarly, approaches to casefinding, although they will not be discussed here, will require careful judgment and planning.

Many communities in the United States, in spite of our generally favorable situation, are still at stage 1. That is, a considerable proportion of the known active cases in the community are not receiving adequate treatment. Concentrating control efforts on treatment may help in some instances, but in order to progress to more favorable stages, these communities will have to find ways of increasing treatment resources. Ideally, of course, tuberculosis treatment services include hospital care and outpatient care, coordinated in such a way that patients who need to be in the hospital can be, and patients who do not need hospital care can be taken care of outside of the hospital. Since such coordination is so often not the actual practice, I will discuss hospital care and outpatient care separately.

### Outpatient Care

The need to improve the quality of treatment received by tuberculosis patients outside the hospital is an insistent issue. Most big cities do provide adequate to excellent outpatient

the hospital. When patients could not get into a hospital, most health departments made an attempt to effect some kind of isolation in the home and to provide such outpatient treatment as there was, but this was always regarded as less than *satisfactory*. Ideally, the patient entered the hospital and stayed there until he had fully recovered.

Under optimum conditions, chemotherapy can reverse the infectiousness of most tuberculosis patients within 3 to 5 months, and of many, much sooner. Most patients under chemotherapy do just as well whether they are ambulant or on bed rest. Obviously, therefore, the majority of patients need not be in a hospital for the entire course of their treatment. Indeed, some patients can be satisfactorily treated without ever going to one.

As a result of these new wonders, the average term of hospital care has become shorter, and many tuberculosis hospitals have closed or converted to other purposes. The quite reasonable assumption is that tuberculosis patients now can be more economically treated in the community. The trouble is that while outpatient treatment can be adequate, it often is not. Health departments have not been staffed or equipped to take care of large numbers of tuberculosis patients. The declining death rate and the closing of hospitals have been interpreted by the public as evidence that tuberculosis services in general can be cut back, and health departments are in considerable difficulty keeping what they have. New treatment services, either in the health department or in other community facilities, are rarely considered. Tuberculosis specialists are in short supply. Few young physicians now choose this specialty, and as tuberculosis hospitals close, members of their medical staffs retire or go into other fields of medicine.

In a great many communities, therefore, most tuberculosis patients are getting inadequate treatment or none at all. They remain as much of a potential problem in public health as were the patients on hospital waiting lists in pre-chemotherapy days.

#### **A Different Approach in Control**

The solution, it appears to me, lies in changing the order of our thinking about tuberculosis control—in being realistic in terms of the tools

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#### **Arden House Conference Recommendation**

The major recommendation of the conference is a program for the widespread application of chemotherapy as a public health measure for the elimination of tuberculosis in the United States.

*Goal.* To sterilize that important part of the reservoir of tubercle bacilli that presently exists throughout the country in persons currently suffering from active tuberculous disease, whether presently known or unknown to public health authorities, and in selected persons who previously have had active disease and were inadequately treated.

*Technique.* Mobilize all resources for a widespread application of the scientifically demonstrated and medically accepted procedures of adequate chemotherapy. These include the proper dosage of appropriate drugs or combination of drugs given continuously over an adequate period of time—procedures that are known to destroy tubercle bacilli in the human body, render the patient's disease noncommunicable to others, and minimize the possibility of reactivation.

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we now have to work against the disease. Where we used to say, "We must find all the persons with tuberculosis, and then treat as many as we can—at least then we will know who they are," I believe the Arden House recommendation is asking us to say, "We will treat all the persons with tuberculosis, and of course, since we do not know who some of them are, we must find them in order to treat them." If we place treatment at the center of our thinking, it can be a much more effective public health measure than it has been so far.

I should like to warn against equating "public health" with "health department." In our complex social organization, a great many agencies and individuals, both public and private, are engaged in activities concerned with public health. Poliomyelitis or DTP injections protect the public health whether they are given in the health department or the private physician's office. In some places, the health department provides treatment for tuberculosis patients in clinics or hospitals or both; in others, the health department does not give any kind of medical care, but treatment is still a public health mea-

medical care, and the number of those who can is in many areas not large enough to support a private practice. Fees paid for clinic work would in some instances make it possible for a physician to afford to specialize.

If physicians are to give proper treatment to tuberculosis patients, laboratory and X-ray services must be readily available. In the ideal situation, the physician has the laboratory report and X-ray, when he has ordered these, at the time he sees the patient. Too often the X-ray the physician sees is one taken at the time of the last visit, which may have been too long a time before to give a picture of the present condition. It may be necessary to have facilities that make it possible to develop and dry X-rays quickly, so that they can be taken on the day of the appointment, or to make special arrangements for patients to come in for X-rays a few days before their clinic appointments.

Laboratory work should include not only smears and cultures for *Mycobacterium tuberculosis*, but also drug sensitivity tests and, especially in some areas, tests for atypical organisms. If the health department does not have a laboratory, a local hospital laboratory may be able to do the work. Tuberculosis associations are a possible source of help in paying laboratory salaries or financing the training of laboratory staffs.

That a chemotherapy program cannot succeed without readily available drugs is a truism. Many programs, however, do not have a budget for this purpose. The cost of tuberculosis drugs is relatively low, but even a small amount of money may be beyond the means of a patient who is subsisting on a welfare budget. Or it may be the reason for lack of cooperation in one who is not very enthusiastic about following medical recommendations. If the health department or hospital board, or whatever agency is providing medical care, does not have funds for this purpose, they can perhaps get help from the tuberculosis association or other agencies in the community. The administration of funds for drugs belongs in the clinic, so that drugs can be readily given to patients without individual and separate arrangements.

The public health supervision of patients

with active disease is of course the responsibility of the health department and is done chiefly by public health nurses. If seriously ill patients are hospitalized and medical supervision of clinic patients is adequate, the nursing service needed for an outpatient tuberculosis treatment program can be given in most communities by the health department's generalized nursing service. When medical supervision is inadequate, however, patients may be carried as "active" or "activity undetermined" cases for long periods without evaluation. Thus the nursing caseload of tuberculosis patients becomes unreasonably large, and priorities for service difficult to establish. Patients may be neglected in the first few days after diagnosis when help given to them and their families in understanding their illness and learning what to do about it could have long-term benefits.

The public health nurse contributes so greatly to tuberculosis control that she often has pushed upon her tasks it is unreasonable to expect her to do. The sometimes laborious and time-consuming job of trying to locate a patient who has moved or cannot be found can be done by someone other than a nurse. This might be a part-time job for a trained layman, or a full-time job shared by several communities. Assignment of trained laymen for this purpose has been worked out successfully by at least one State.

In some areas, public health nurses give twice-weekly streptomycin injections, and this is another task that could well be done by someone else. If there is no visiting nurse service, a registered or practical nurse could be hired specifically for this purpose. Married nurses might be found who could take it as part-time work.

In all of these instances, if public funds are not available, tuberculosis association help might be sought to pay salaries.

Chemotherapy applied as a public health measure requires a system of providing services in a way that does not place the patient on one side and the community on the other. The patient's ability and willingness to accept treatment are as important as the services offered. While it cannot be denied that a small percentage of tuberculosis patients will remain stub-

treatment; because they usually have large caseloads, they may need more services and facilities, but the quality of their treatment programs is by and large very good. In many smaller communities, however, tuberculosis patients who are not in a hospital receive meager treatment or none at all. Little can be done to "mobilize all resources for a widespread application of the scientifically demonstrated and medically accepted procedures of adequate chemotherapy" in such situations without some new thinking and a willingness to explore every possibility.

Although new funds or additional professional workers are not easy to obtain for tuberculosis programs at present, the possibility of getting either will be much better if the best use is made of money and people now available and if specific proposals can be made for the use of new money. I have therefore been considering what is needed for good tuberculosis outpatient chemotherapy treatment and attempting to spell out a number of possible ways of providing what is needed. While the suggestions made are directed especially toward services for the 50 percent of patients who live elsewhere than in cities of more than 100,000 population, some of them may apply in urban centers as well.

The various services needed for a treatment program may be provided by different agencies or paid for from different funds, but the success of each in promoting the recovery of tuberculosis patients depends upon how well they all supplement and support each other. In most communities, the health department, because of its legal responsibility for tuberculosis control, is the most appropriate agency to coordinate all services for tuberculosis patients.

In the big cities the number of tuberculosis patients treated in outpatient facilities is sufficiently large to require full-time medical staff for tuberculosis clinics. Elsewhere, the limited time of consultant physicians is used for film reading or evaluation of patients' records, and it is common for tuberculosis patients to see a physician only very rarely. When the patient comes to the clinic, he sees a nurse, who has the responsibility of interpreting to him whatever information or recommendations the physician may have recorded when he reviewed the case.

She must answer the patient's questions and encourage him to continue treatment. Her record of her interview with the patient is all the physician has to go by except laboratory reports and X-rays. In this kind of situation, the nurse carries an inappropriate burden. The physician cannot give the professional services the patient needs, and the patient is often unsatisfied and disinclined to follow recommendations that reach him secondhand. For the patient with tuberculosis, certainly when it is active, seeing a physician once a month seems a reasonable requirement.

Remedies are not easily at hand, but a number of possibilities are worth consideration. The limited time of the tuberculosis specialist, who perhaps comes into the community only occasionally, might be better used in consultation with local general practitioners, who in turn could provide continuing medical care to patients. In this kind of arrangement, when patients were unable to pay, the local physicians could be paid for their services by the health department, the tuberculosis hospital board, or whatever agency is responsible for care of tuberculosis patients. The advice of the county medical society could be sought in selecting physicians, and in arranging for them to be paid. It would seem wise, moreover, for specialist consultation to be available to all physicians treating tuberculosis patients, whether the patient or the community pays for the treatment.

Another plan that has been found feasible in some areas is the staffing of tuberculosis outpatient clinics by physicians from tuberculosis hospitals. If clinics are held in communities within a reasonable distance from the hospital, it should be possible for them to be frequent enough to allow physicians to give patients appropriate personal attention.

In communities where the tuberculosis clinic caseload is not large enough to justify full-time medical staff but where there is a chest physician, or an internist or general practitioner with special interest and training in chest diseases, an arrangement might be made for part-time service from the private physician, for which he would be paid by the appropriate agency. A high proportion of tuberculosis patients now are not able to pay for long-term

such a situation is not an insurmountable obstacle.

An orderly plan for chemotherapy as a public health measure includes hospitalization for patients who need it when they need it, and therefore requires the wisest use of expensive hospital facilities—for newly diagnosed patients and for patients who need surgery or who do not respond to therapy. (Some patients remain infectious in spite of the best possible treatment, but it seems reasonable that such "lifetime" patients can be cared for with less than a full range of hospital services.) Physicians treating patients in clinics should be able to get them hospitalized when it is suitable. Clinging to the old patterns of prolonged stay for all patients admitted and separation of hospital and clinic does not fit into such an orderly plan.

The second issue, how the patient feels about hospitalization, is also a concern in public health. The AMA rates in many hospitals are very high. Even if one were to take the attitude that all those who left against advice should be rounded up and returned to a locked ward, it would be impossible to carry out that kind of policy. If, on the other hand, an attempt is made to accommodate recommendations somewhat to the patient's feelings about going to the hospital, it seems likely that more patients can be helped to get more benefit from hospital care. The patient who is dismayed at the prospect of months in the hospital can perhaps be persuaded to stay for 1 month. If that month is recognized as a planned short stay, and used as an opportunity for intensive care and education, it may prove more profitable in the long run than several months that end when the patient gets fed up and leaves.

A plan like this would of course require good prospects for outpatient care after hospitalization, and here again the hospital would have to have a part in the responsibility to see that it was provided. If the hospital is to continue as the principal purveyor of medical care for tuberculosis patients, it can no longer reasonably concern itself only with those patients who willingly stay for the recommended period.

I do not deny that some small percentage of patients, like a small percentage of the total population, are genuinely recalcitrant and will not cooperate with any recommended course.

For these, forcible isolation is probably the only solution. But many others would accept and follow through with outpatient treatment that was planned with them. And treatment that is less than ideal is better if it is completed than the best possible treatment if it is abandoned.

At the Arden House conference, one of the participants commented on the problem that arises because so many tuberculosis patients are in lower socioeconomic classes, while public health and medical professional people are chiefly from the middle class. He pointed out that the professional person often tries to impose his own ideals and aspirations upon the patient and is frustrated to get no response. Many of us, for instance, knowing the overcrowded, dilapidated, depressing (to us) homes some patients come from, feel that they ought to be happy to be in the nice clean hospital. We think they are ornery if they prefer to stay at home. It takes imagination, and a willingness to accept when we cannot imagine, to help patients toward a way to recovery, but success in using chemotherapy as a public health tool depends upon it.

### State Planning

Patterns for providing treatment services for tuberculosis patients vary widely in the States. In a small group of States, none of the public tuberculosis hospitals is supported solely by the State, and in a few they all are. The most common pattern, however, is a combination of State hospitals and county or city hospitals. Whether they are State or local, hospitals may be under the health department, a separate hospital department, or under the welfare department. Clinic services come under equally varied auspices.

While efficient and effective treatment services are possible under many different organizational plans, the present situation in tuberculosis does call for coordination at the State level, in order to make sure that patients are treated no matter whether they live in low or high incidence areas, and also for the sake of economical operation. It seems important now to plan services according to reasonable caseloads. Obviously it is wasteful for several counties in a State to run tuberculosis hospitals in which



bornly uncooperative in spite of every effort, most patients will stay with recommended treatment if it is possible and reasonable for them to do so.

The location of clinics is an important factor in such a system. While modern transportation allows one clinic to serve a fairly large area, it is not reasonable to expect patients to make a half day's journey to the clinic. Volunteers can serve effectively in taking patients to and from the clinic. If they cannot be recruited, and patients must use public transportation, some arrangement must be made to pay their fares.

Scheduled appointments and reminder letters should be a part of the system, and if volunteers can be found to interest themselves in getting patients to the clinic, they may be helpful in the reminding. The clinic itself should be made as pleasant and attractive as possible, and here again volunteers can often be helpful. A coat of paint may not transform dingy quarters completely, but it can help a great deal in making them more cheerful.

The area of economic and social assistance is too broad to discuss in detail, but a patient cannot be expected to stop work in order to protect the community from his infection unless the community takes some responsibility for income sufficient for food, shelter, and other necessities of life for him and his family.

The public health purpose of tuberculosis treatment also precludes withholding drugs or services from patients because they have left the hospital against advice or committed minor infractions of rules. It indicates instead a conscious attempt to work out with the patient a regimen that he can accept, even if it would not be the first choice of the physician. The patient's cooperation is so essential that all reasonable concessions are justified in order to obtain it.

### Hospital Care

Hospital care is the most costly single item in tuberculosis control. Even though a great many tuberculosis hospitals have closed or have been converted to other uses, rising unit costs have kept the total cost high. The most advantageous use of hospitals in the total program of tuberculosis treatment is therefore of utmost importance.

I think there is little disagreement with the concept that a period of hospitalization, beginning as soon as a diagnosis is established, provides the best circumstance for recovery for any tuberculosis patient. How long the patient should stay in the hospital is a matter about which there is a greater range of opinion. The most conservative position is that the patient should stay until he has fully recovered. While chemotherapy has made this a shorter period than used to be necessary, "full recovery" even today means about 18 months. The trend in many hospitals is toward much shorter stays, until the disease is inactive (about 9 months in the majority of cases), or, even less conservative, until the patient is no longer infectious (not more than 6 months in the majority of cases).

Two issues in addition to the theoretical "best circumstance" for treatment of tuberculosis need to be considered in recommended length of hospital stay. In both, it is implicit that in order to provide good care for tuberculosis patients the hospital must operate as a part of the community. The two issues are: first, whether the patient will continue to receive adequate care when he leaves the hospital; and second, whether he is willing to stay in the hospital or, in his own thinking, is able to do so.

Because of the first issue, it is not unusual for hospitals to keep patients, or to try to, for longer periods than now are actually necessary. Hospitals may be separated from community clinic services, either because they fall in different government jurisdictions or because they are geographically isolated, or both. In some communities, as I have already said, appropriate clinic services do not exist. For all of these reasons, it is not surprising that hospital staffs sometimes feel they are giving the patient the best chance of recovery if they keep him for the full course of his treatment. Looking at the matter objectively, and in terms of what is best for tuberculosis control, however, it seems apparent that a better course would be for the hospital to take a hand in providing clinic services, either in its own outpatient department or elsewhere, if its location makes that impractical. If the hospital is under one government department and an existing clinic in need of staff under another, negotiation may be necessary, but

such a situation is not an insurmountable obstacle.

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many beds are unoccupied. Under a State plan, such counties can be encouraged to pool their resources, thereby saving both money and staff which can perhaps be diverted to outpatient services. In some areas of the United States, tuberculosis patients outside the hospital are too few to justify a monthly clinic in a single county. Even if county health departments can arrange for local physicians to give medical care, the State may need to see that laboratory services, perhaps X-ray facilities or interpretation or consultation, are provided. If local medical care is not available, the State may have to arrange for physicians to be brought in once a month to see patients.

The amount of direct service or financial assistance the State gives is not at issue. Any State health department should be able to serve in a coordinating capacity.

In a number of States, well-established precedents for intercounty cooperation enable the State health department to work out a State plan for tuberculosis treatment as easily as in States with completely centralized services. Where local autonomy is highly prized, however, a good deal of persuasion and convincing may be necessary. In this case, interpreting the advantages of banding together may have to be the job of citizens' groups such as the State tuberculosis association.

## Illegitimacy Report

A report on illegitimacy and its relation to aid to dependent children (ADC) has been published in booklet form by the Bureau of Public Assistance, Social Security Administration. The material was prepared at the direction of the Senate Appropriations Committee on the 1960 appropriation bill for the Labor and Health, Education, and Welfare Departments.

In transmitting the study, the Commissioner of Social Security, William L. Mitchell, pointed out that "the great majority (over two-thirds) of the children under 18 who were born out of wedlock are living with natural parents or relatives. Only one out of eight is receiving support through the aid to dependent children program." The study reveals that:

- Over a 20-year period the increase in illegitimate births has been from about 4 to about 5 in each 100 live births.

- Children of unmarried mothers represent 16 percent of all ADC children, and their families account for 20 percent of all ADC families. The proportion has risen not only because of the rise in the number of illegitimate children but also because the old-age, survivors, and disability insurance program has increasingly provided income for children whose fathers have died, with the result that few children whose fathers are deceased receive ADC benefits.

- Almost half of all aid to dependent children families have incomes, including their assistance payments, below the subsistence level measured by the States' assistance standards.

- The average time that ADC is received for children of unmarried mothers is less than 2½ years. The great majority of illegitimate children on ADC were born before the family received assistance.

- Many ADC families are partially self-supporting: almost half have income in addition to assistance, principally from earnings of the mothers and contributions from the fathers.

- More than 15 percent of the mothers of illegitimate children work full or part time.

The report states that "it would be surprising if the motivating factor in repeated pregnancies out of wedlock were the mother's desire to increase her assistance payment to cover part of the basic cost of rearing another child."

Entitled "Illegitimacy and Its Impact on the Aid to Dependent Children Program," the report used, in large part, material from many State and local agencies and private organizations. The National Office of Vital Statistics, the Public Health Service, and other government and voluntary agencies also analyzed and prepared special materials.

# Distribution and Control of Rats in Five Rocky Mountain States

F. C. HARMSTON, B.S., and C. T. WRIGHT, M.S.

COMPREHENSIVE investigations on the distribution and control of domestic Norway rats (*Rattus norvegicus*) were conducted from 1947 to 1955 in the Rocky Mountain area comprised by Colorado, Idaho, Montana, Utah, and Wyoming. These investigations sought data essential to the organization and operation of effective programs of rodent control at State and local levels.

The objectives were (a) determination of the distribution and relative population densities of domestic rats, (b) evaluation of the factors influencing their distribution, rate of spread, and degree of infestation, and (c) appraisal of the results of past and present control activities.

Representatives of the Communicable Disease Center, Public Health Service, who were assigned to the State departments of health, and Public Health Service Region VIII, Denver, Colo., conducted the investigations in cooperation with personnel from the State and local departments of health. In numerous instances, representatives of the U.S. Fish and Wildlife Service assisted in making the surveys and also contributed valuable information regarding the history of rat infestations and the attempts that have been made to control these rodents. Information of great value to the studies was also provided by agricultural extension officials, public agencies, and private individuals.

All the known areas of infestation in the five

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States were visited. No survey was made of remote communities and farming districts situated at considerable distances from main highways or railroads, or those isolated by desert or mountain barriers from known rat-infested localities. Visits were made to garbage and refuse dumps, packing houses, feed mills and elevators, dairies, livestock yards, hog and poultry farms, and other likely harborages and breeding places of rats in urban and rural localities. Canals and natural watercourses were also inspected, since it became apparent early in the studies that indiscriminate dumping of garbage and refuse along and into streams is a factor which contributes to the spread and maintenance of rat populations.

In this report, the term "rat" refers only to the Norway rat, since the survey revealed the presence of the roof rat (*Rattus rattus*) only in Salt Lake City, Utah. No reference is made to any of the various native rodents, such as *Neotoma*, which sometimes occur in or around human habitations.

Distribution of the Norway rat in Colorado, Idaho, Montana, Utah, and Wyoming, as ascertained by the studies from 1947 to 1955, is indicated on the map.

## Colorado

According to Silver (1) rats were reported in Denver in 1886, and by 1907, they were entrenched in most of the larger towns of the State. Our studies in Colorado showed that most of the towns and farming areas in the eastern half of the State are infested with rats. No evidence of rats was found at any locality within the San Luis Valley, which lies east of

the Continental Divide, and, with the exception of Salida, no evidence of rats was found in towns above 7,000 feet elevation along the eastern slope of the Rocky Mountains. Also, no evidence of rats was found in any locality in Colorado west of the Continental Divide. It appears that the dry, sparsely populated areas along much of the eastern slope of the Rocky Mountains have served as effective barriers to the migration of rats in Colorado.

## Idaho

Three widely separated areas of infestation were found in Idaho during the surveys conducted in 42 of the 44 counties of the State. No survey was made in Blaine or Camas Counties, both of which were authoritatively reported by personnel of the Idaho Department of Health to be free of domestic rat infestation.

The largest area of infestation in Idaho covers all or portions of nine northwestern counties. This area extends southward along the Idaho-Washington border from the south-central part of Bonner County through much of Kootenai, Benewah, Latah, Nez Perce, and Lewis Counties, east into Clearwater County, and thence south through an extensive portion of northwestern Idaho County. The infestation also extends eastward from Kootenai County through the rural and urban areas along U.S. Highway 10 in Shoshone County to within a few miles of the Montana line.

The exact date of the initial infestation of these northern counties is not known, but local residents reported that rats have been troublesome in certain localities of Kootenai, Latah, and Nez Perce Counties since the early 1920's. Reports indicated that the early infestations in these counties spread from the west to the southeast, implying that the initial infestations probably occurred when rats migrated into northern Idaho from heavily infested adjoining localities in the State of Washington.

Franklin, Bannock, and Oneida Counties in southeastern Idaho have been invaded by rats within the past 20 years. According to C. P. Maughan, district sanitarian, Idaho Department of Health, rats were first observed in Franklin County about 1940, when they apparently migrated northward from adjacent

Cache County, Utah, where severe infestations had developed during the 1930's. The spread of rats in Franklin County progressed at a rapid rate, probably because they were migrating from an abundant base population in Cache County, Utah. By 1954, rats were established in most of the towns and farming areas of Franklin County and had reached the Oxford and Swan Lake areas of southern Bannock County.

It appears almost certain that only a short time will elapse, in the absence of adequate control measures, before rats cross the divide between the Bear River and Snake River watersheds, and they will then have a favorable route of migration along Marsh Creek to the more heavily populated rural and urban areas in Bannock County. Rat infestation of this area would pose a serious problem, since it would open the way for rats to invade the entire upper Snake River Valley, which in 1955 was entirely free of rats.

Rat infestation of Oneida County, according to Maughan, was first reported in the spring of 1947, when a few rats were trapped at Woodruff, about 2 miles north of the Utah line. By 1950, rats were being reported in the vicinity of Malad. Surveys in the spring of 1954 showed a heavy infestation at Malad, but no evidence of rats at any of the ranches along U.S. highway 191 north of Malad and south of the Bannock County line.

In southwestern Idaho, portions of Ada and Canyon Counties have become infested in recent years. The first reported infestation of Ada County was in 1946, when a few rats were trapped in Boise. A survey of southwestern Idaho in 1949 revealed that rats had begun to migrate westward from Boise along the Boise River.

As a result of the survey in 1949, which indicated that rat populations in Boise and vicinity were increasing rapidly, a program of rodent control was initiated by the Boise City-Ada County Health Unit in conjunction with the Idaho Department of Public Health. Despite this control program, which included the use of poisons and elimination of open dumps along the Boise River, rats continued to spread westward, and in the spring of 1953, they were first reported in the vicinity of Caldwell and Nampa

Distribution of the Norway rat (*Rattus norvegicus*) in Colorado, Idaho, Montana, Utah, and Wyoming in 1955



in Canyon County. The infestations in Ada and Canyon Counties have thus spread through a fairly heavily populated area, approximately 40 miles in length and 15 miles in width, during a period of about 10 years. The rate of migration in Ada and Canyon Counties was much faster than in Franklin and Oneida Counties, probably because of the relatively few people in the latter two counties. The spread of rats

in these four counties illustrates the cumulative effect of short, local wanderings which enable rats to spread over extensive areas in a short time.

#### Montana

Silver (1) indicates that Montana was the last State permanently invaded by the domestic

rat. He states that a few rats were found in Lewistown, Fergus County, during the summer of 1926, and that investigations indicated that the initial infestation occurred about 1923. He also states that rats were introduced into the Fort Benton area of Chouteau County during the early days before railroads, when freight for mining camps was transported up the Missouri River by river packet. For a time, rats were reported to be quite numerous in the Fort Benton area, but later they disappeared. Silver further states that rats gained a foothold in Helena in the early days, but since have entirely disappeared.

Tryon (2) refers to the first permanent establishment of rats in Montana as occurring in Lewistown at some time between 1920 and 1925. This infestation is stated to have spread over most of Fergus County by 1936, and westward through much of Judith Basin County by 1947. According to Tryon, rats also entered the eastern part of the State near Sidney in Richland County about 1936, and within a few years had spread through most or part of the nine counties of Daniels, Sheridan, Valley, Roosevelt, Richland, Dawson, Wibaux, Fallon, and Carter. The infestation in eastern Montana spread rapidly during the decade 1936-1946 as a result of migrations from abundant base populations in adjoining areas of North Dakota and the Province of Saskatchewan in Canada.

During 1950 and 1951, studies relating to the problem of rodent control in Montana were conducted in 46 of the 56 counties in the State. The surveys did not include all counties lying west of the Continental Divide, inasmuch as this area was reported to be free of rats. The studies showed that much of Fergus and Judith Basin Counties was infested with rats. However, no evidence of rats was found in the Fort Benton area or in Helena. The area of infestation in eastern Montana was found to include most of the communities and farming districts bordering the Province of Saskatchewan, Canada, on the north, and North Dakota on the east. This area included all or portions of 12 counties extending from the northeastern part of Phillips County which adjoins the Canadian border, to the northern part of Carter County in the southeastern section of the State. From available information, it appears that

the rat infestation of Fergus, Judith Basin, and Wheatland Counties in central Montana was originally established by common carrier at Lewistown. The invasion of counties in eastern Montana was accomplished by the migration of rats overland, apparently without the aid of commercial vehicle or other manmade transport. All the migrations followed streams or highways and roads, and moved relatively faster in the more thickly populated areas. In the thinly settled ranching districts of the State, the rate of migration was slower, indicating that the scarcity of settlers is a factor inhibiting the rapid migration of rats. The rat invasion of eastern Montana has demonstrated that by reason of their high biotic potential and their adaptability to different environmental conditions, rats are capable of spreading across extensive areas in which the situations are marginal for them.

## Utah

The rat-infested area of Utah was found to include most of the central valley of the State from the Idaho border south to the northeastern part of Juab County, bordered on the east by the Wasatch Mountains and on the west by the Great Salt Lake and Utah Lake. Isolated infestations were also found at Park City in Summit County, Delta in Millard County, and near Roosevelt in Duchesne and Uintah Counties.

During the early period of settlement, Silver states that rats were not present in Utah in 1888, but in that year they were reported to be abundant in Albuquerque, N. Mex., and were known to be present in Arizona. Allen (3) reported that there was no evidence of the house rat in the Salt Lake Valley, Utah, in 1874 but that the house mouse had been introduced into that area and was common in homes and fields.

The earliest authenticated record of the presence of rats in Utah was provided by the late N. W. Pickett, former senior sanitarian, Utah State Department of Health. According to Pickett (personal communication, 1948), rats were first observed in Salt Lake City about 1900, but for several years afterward they were apparently low in numbers and were observed only in the western portion of the city in the

immediate vicinity of the railroads. This would suggest that the domestic rat was imported into Utah by railway cars. By 1914, rats were reported to be causing considerable damage in grocery stores in the downtown area of Salt Lake City, and were present in large numbers at the Utah State fairgrounds in the western part of the city.

From available information (personal communication from DeLore Nichols, former agricultural agent, Davis County), rats first appeared in Davis County between 1916 and 1918 at which time they were most numerous in the southern portion of the county, particularly in the Bountiful area. By 1920, the infestation had spread northward to the vicinity of Centerville and by the autumn of 1927, nearly all portions of the county were infested. The infestation of Davis County apparently resulted when rats migrated from the base population in adjacent Salt Lake County.

S. R. Cunningham, former chief sanitarian, Ogden City Health Department, informed the senior author that the presence of rats in Ogden, Weber County, first came to his attention in 1903 when he investigated rat infestation at a bakery located in the west portion of town. Since this bakery was located in the vicinity of the railroads, it appears likely that the original infestation at Ogden, like that at Salt Lake City, resulted when rats were transported into the area by railway.

According to R. A. Madsen, former city sanitarian, Brigham City Health Department, the first instance of damage resulting from rats in Brigham City, Box Elder County, occurred in 1922 when poultry producers reported serious damage to stored feeds and loss of chicks and eggs. Residents in other areas of Box Elder County stated that rats were first observed in the vicinity of Willard about 1920, but they were not observed in the Corinne, Plymouth, and Collinston areas until about 1935, and not until about 1940 at Portage. The migration of rats in Box Elder County apparently progressed in a northerly direction and required about 20 years to cover the area from the Weber County line to the Utah-Idaho boundary.

The first authenticated record of rats in Cache County in the north-central part of the State, is supplied by Dr. E. G. Titus, former

head of the department of zoology, Utah State University. Dr. Titus informed the senior author that an infestation of rats at Cache Junction was called to his attention in the spring of 1911, and this was his first experience with domestic rats in Utah. The presence of rats in Cache Junction in 1911 and the fact that this community was then an important center for the shipping of grain suggest that rats were brought into Cache Valley by the railroad. Moreover, there were no known infestations at that time in the adjacent counties of Utah or Idaho from which the rats may have migrated into Cache County.

The presence of rats east of the Wasatch Range in Utah was first reported to the senior author during the autumn of 1949 by P. H. Kiser, sanitarian, milk division, Salt Lake City Health Department, who had just returned from Duchesne County where he found a dead Norway rat in a metal watering trough at a dairy located one mile south of Roosevelt. Subsequently, a survey in the fall of 1949 showed rats to be present at this dairy and several were trapped at an adjacent hog farm and the nearby community garbage dump. Exhaustive surveys during 1950 and 1951 disclosed no evidence of rats elsewhere in the Uintah Basin, or in any other locality in Utah east of the Wasatch Mountains. In the fall of 1955, rats were observed at farms situated along Cottonwood Creek several miles east of the Roosevelt community refuse dump. This constituted the first record of rats in Uintah County. Information obtained from surveys conducted during 1949 to 1955 indicated that the rat population in Duchesne and Uintah Counties was low in numbers and confined to the vicinity of Roosevelt. This suggests that rats were introduced into this area at a relatively recent date, and sufficient time had not elapsed for them to become widespread.

## Wyoming

With respect to the early history of rat infestations in Wyoming, Silver (1) wrote as follows: "With exception of Montana, Wyoming has been the last State invaded, the first rats apparently crossing the border from Nebraska about 7 years ago (1919), while at the present



time they are reported as having worked their way up the Platte River Valley as far as Fort Laramie and as being common along much of the Nebraska line. They are also firmly established at Sheridan, not far from the Montana line."

During the rodent surveys from 1947 to 1955, all of the counties of Wyoming were visited, and four widely separated areas of infestation covering portions of seven counties were found within the State. Of these infested areas, the most extensive is located in the southeastern corner of the State and includes a large portion of Laramie County and parts of Goshen and Platte Counties. At present, most of the towns and ranches along U.S. Highways 85, 87, and 26, from Guernsey, Fort Laramie, and Wheatland in the north to the Colorado line in the south, are infested. In all probability, these infestations developed during the past 40 years as a result of the rats advancing westward from base populations in adjoining areas of Nebraska.

More recently, rats have been introduced into Albany County. In 1947, intensive surveys disclosed no evidence of rats at Laramie and vicinity. However, when the area was again surveyed in 1949, a few rats were observed at an animal byproducts plant located several miles north of Laramie and also at several points along the Laramie River and railroads north of the city. The Laramie business and residential districts and the city dump to the northeast of the city showed no evidence of rat infestation during the latter part of 1949.

No evidence of rats was found at Casper or other localities in Natrona County during surveys in 1949 and 1950. Previously, in 1948, albino rats were reported inhabiting the Casper city dump, which is located east of the city and along the banks of the North Platte River. According to local officials, these albino rats were entirely eradicated by poisoning during the winter of 1948. There were no further reports of rats in Casper until the summer of 1954, when a few rats were detected and killed in the business and residential districts. In the winter of 1954, a survey disclosed rats at several places in Casper and also showed a light infestation of Norway rats in the outlying city garbage dump. The surveys showed that a sizable portion of

Sheridan County extending from Ranchester and Dayton in the north, to Clearmont, Story, and Ucross in the south, is infested with rats. Also, it was found that rats have spread southward from Sheridan County along Clear Creek into Johnson County, but in June 1950 they had not reached the city of Buffalo. In the surveys of 1950, no evidence of rats was found in the extreme northern part of Sheridan County, from which it was concluded that rats had not migrated northward from this county into adjoining Big Horn County, Montana.

The rat infestations at Laramie, Casper, and Sheridan are isolated from other infested localities in Wyoming and adjacent States by extensive and barren uninhabited areas which restrain the natural migration of rats. In all probability, rats were introduced into these areas by means of the railroads or other man-made transport, reaching Laramie from about 1947 to 1949, Casper between 1950 and 1954, and Sheridan during the early 1920's.

### Discussion

The foregoing information indicates how domestic rats have invaded extensive areas in the northern Rocky Mountain States and have become firmly entrenched in localities having wide diversity in physiography, vegetative cover, and land utilization. Many of these infestations have developed during the past 30 years despite rat-poisoning campaigns conducted at local and county levels.

In localities of the northern Rocky Mountain States where rats had become firmly established before control operations were undertaken, poisoning campaigns have resulted only in a temporary reduction of the rodent population and have failed to prevent the spread of rats into adjoining uninfested areas. At three localities in Utah, notably Blue Creek in Box Elder County, Kimball Junction in Summit County, and the Ingraham ranch located 2 miles south of Mona, Juab County, poisons have been utilized to eradicate incipient and isolated infestations. In each of these places the rats were detected and destroyed before they had time to propagate and become well established. It appears highly probable that rats will continue to follow a pattern of population expansion

similar to that of the past, and new areas in the Rocky Mountain States will continually be invaded unless control measures more effective than the brief poisoning campaigns employed in the past are initiated and maintained.

The failure to recognize the extreme propensity of rats for becoming entrenched in any environment that provides them with adequate food and harborage has been the chief reason why effective, permanent control has not been achieved in the Rocky Mountain States. With few exceptions, all of the rodent control work in these States has been conducted on a request or complaint basis due to lack of personnel at both State and local levels for this purpose. A few cities such as Salt Lake City and Provo, Utah, and Boise and Lewiston, Idaho, have made noteworthy progress toward eradication of rats from their business and residential districts. In these cities, highly effective control programs, based on the elimination of food supplies, harborages, and breeding places of rats, were initiated during the 1940's. In other localities where eradication or control of rats has been attempted by brief poisoning campaigns and without regard to the elimination of rat harborages and food supplies, little or no success has been achieved. The experience acquired in the northern Rocky Mountain States during the past 30 years has clearly demonstrated that control of the Norway rat is a highly skilled profession, and to be successful, a control program must have intelligent planning, trained leadership and guidance from the State level, and full support and cooperation of the public in order to eliminate the food supplies and harborages upon which rats are dependent.

The domestic rat is unquestionably the most destructive mammalian pest, and a serious menace to public health. Sylvatic plague exists in native rodents in most of the western and Pacific Coast States. Urban sections adjacent to areas where wild rodents are infected with sylvatic plague, face a plague threat through the possible infection of domestic rats by transfer of fleas from native rodents, as noted by Hartwell and associates (4). With the exception of murine typhus, which in North America is mainly confined to the southeastern States, and sylvatic plague, which exists in wild rodents in

the western States, other ratborne diseases including leptospirosis, trichinosis, ratbite fever, and salmonellosis may occur anywhere that rats exist.

It is now the opinion of public health workers that the ideal approach to control of domestic rodents is through a program of education whereby the general public is made aware of the menace to public health and the severe economic losses caused by rats. Local, county, and State departments of health, which have established procedures for reaching all segments of the population in matters of public health, are in a position to initiate an educational program of this nature. County agricultural extension agents are in an extremely advantageous position to distribute information to the residents of rural areas relative to the advantages of rat control and the importance of maintaining their premises free of harborages and breeding places of rats. Municipal officials who have responsibility for the collection and disposal of garbage and refuse should take steps to eliminate open refuse dumps by providing sanitary landfills or other approved methods of refuse disposal. In the areas of infestation, open dumps are a serious obstacle to the success of rat control programs. In areas presently uninfested, open dumps should be eliminated as a practical rat-exclusion precaution.

The following basic measures are essential to the success of a permanent control program:

1. Good general sanitation, with particular emphasis on proper garbage and refuse storage, collection, and disposal.
2. Rat stoppage and rat eradication in existing buildings.
3. Ratproof construction of new buildings.
4. Rat-poisoning programs.

The enactment of suitable rodent control and other sanitation ordinances is essential to obtaining the first three items listed. All four items are considered essential in a complete and continuous program. No one measure will be adequate, and all should be encouraged, although it may not be possible to initiate all phases of a control program simultaneously.

### Summary

Investigations on the distribution and control of domestic rats were conducted in Colorado,

Idaho, Montana, Utah, and Wyoming, from 1947 until 1955. The studies showed domestic rats to be present in each of these States, and in the majority of cases, the areas of infestation are rapidly expanding despite periodic poisoning campaigns which have been used as the principal method of control during the past 30 to 40 years.

Since the northern Rocky Mountain area is one of the few remaining sections in this country where much territory is wholly free of rats, there exists a real challenge for local, county, and State departments of health, and other agencies concerned with safeguarding public health and the general welfare to undertake programs to eradicate rats in the infested areas

and to prevent their migration to presently uninfested areas.

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*Photographs of their children induce mothers to keep appointments  
in a long-term study on their growth and development*

# Participation in a Longitudinal Study of Negro Infants and Children

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**N**UMEROUS problems accompany longitudinal studies in which participation depends on voluntary cooperation. The degree of cooperation obtained may be related to the type of population studied as well as to the benefits, if any, which participants feel they are receiving. Even under the most favorable conditions such factors as migration and loss of interest are difficult, if not impossible, to control.

Yet, as Senn has stated (1) longitudinal studies produce answers to certain questions that cannot be found by any short-term approach. It therefore becomes important to attempt to isolate characteristics, attributes, or traits which encourage or discourage cooperation in longitudinal research.

In the general area of public health research, it might be assumed that socioeconomic status will play an important part in the degree of

cooperation received. Simmons (2) raises the question of whether persons of lower status are as willing as those of higher status to inconvenience themselves in the present for possible benefits in the future. He further states, "The lower status individual may be much less likely to think that responsibility for his well-being rests solely with himself, and more likely to think that if something does happen the kin group will see him through."

Simmons feels also that there may be a tendency for "higher status patients" to reject the health worker because "they perceive his attempts to serve them at all as identifying them with the lower status people typically served by public health, and thus regard him as a threat to their social position."

In a study of a group of Negro and white mothers, Yonkoner, Gross, and Romeo (3) found that within 1 year after delivery more than one-half of the mothers had moved. This degree of mobility becomes a serious handicap if participants move outside the research area or fail to leave a record of their new addresses when moving within the research area.

Since 1953 the department of pediatrics of the George W. Hubbard Hospital, Meharry Medical College, has been studying the growth and development of Negro infants and children in Nashville, Tenn. It is our purpose to discuss some of the specific problems encountered in maintaining cooperation in the study, to describe some of the devices used to encourage

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cooperation, and to attempt to measure the influence of socioeconomic status and certain other factors in order to learn whether these are specific, determining characteristics in relation to cooperation.

### Methods and Materials

The study from which the data are taken has been described elsewhere (4-7). Basically, it consists of an analysis of anatomical, physical, and psychological factors influencing the growth and development of Negro infants from birth through 5 years of age. The mothers enrolled in the study are seen prior to delivery in order to obtain a prenatal nutrition record and a socioeconomic index of the family. After delivery, physical and bone X-ray examinations and psychological evaluations are made of each child at 3-month intervals from birth through 24 months and thereafter at 6-month intervals until the child is 5 years old.

Each mother is sent a letter 6 to 7 days in advance of the scheduled appointment, setting a specific time and day. The mother is invited to call the research office if another time or day is more convenient for her. When an appointment is missed, the medical social worker tries to contact the mother personally to insure that the child is seen. The research staff provides transportation to and from the hospital if the mother requests it.

Included in this analysis is a group of 523 mothers of children who were between 36 and 42 months of age by March 31, 1959. By that time each mother should have made at least 10 visits to the clinic. Not all of these mothers, however, were still being scheduled for appointments. Some had become inactive because of movement within or outside the city or lack of cooperation. The 11 mothers whose children had died are excluded from the study.

Of the 523 mothers, 247 who had moved and could not be reached or were not responsive were listed as inactive; 276 remained in the active group.

These two groups are compared to ascertain whether the active and inactive mothers differ with respect to socioeconomic status, number of children, education, age, and marital status and whether these factors have a bearing on continued participation.

The active mothers are also grouped according to these various characteristics to see if they are related to the number of appointments kept. Analysis by number of completed appointments was impracticable for the inactive group because of the varying ages of the children at the time of withdrawal (table 1).

The division into active and inactive groups should not be taken to mean that all mothers who become inactive are necessarily uncooperative. The three reasons for becoming inactive (table 1) reflect varying degrees of cooperation. Certainly the mother who is unresponsive is not necessarily comparable with the mother who moves outside the city.

While cooperation for the active group is measured for practical purposes in terms of the number of appointments kept, we are not assuming that the degree of clinical participation is a complete indication of clinical cooperation. The amount of effort required to obtain each appointment varies with each mother. Some mothers come in when scheduled with no additional prompting; some have to be reminded; others may break several appointments before one is kept. This, too, cannot be fully quantitated and is beyond the scope of this paper. Cooperation has been equated with participation since participation is after all the ultimate aim.

### Difficulty in Maintaining Cooperation

Undoubtedly all longitudinal research projects have problems in common. In addition there are difficulties peculiar to specific studies. The following apply to the present study:

- The high rate of mobility within the city greatly impairs followup because many of the mothers fail to leave forwarding addresses. Since they often do not establish separate households, they frequently cannot be traced. Almost three-fourths (72.6 percent) of the inactive mothers are so classified because they had moved. Of this total, 74.3 percent moved within the city, leaving no forwarding address or other means of being reached.

- A large number of homes have no telephone. When an appointment is missed, the social worker must contact the mothers personally, often making repeated trips.

**Table 1. Percentage distribution of 247 mothers who became inactive, by age of child and reason for withdrawal**

Age of child (months)	Reason for becoming inactive		
	Moved within city (N=133)	Moved outside city (N=46)	Uncooperative (N=68)
3-----	1.5	19.6	5.9
6-----	4.5	2.2	-----
9-----	10.5	-----	4.4
12-----	6.0	13.0	11.8
15-----	9.0	19.6	17.6
18-----	14.3	13.0	11.8
21-----	18.0	13.0	10.3
24-----	12.0	8.7	7.4
30-----	10.5	6.5	4.4
36 or more-----	13.5	4.3	26.5
Total-----	100.0	100.0	100.0

- Many mothers return to work before or shortly after the scheduled 3-month appointment. Generally, working hours of the mothers coincide with those of the research staff.

- The subsequent birth of children increases demands on the mothers' time. Also mothers with several young children frequently have a baby-sitting problem.

- After the first year of participation, many mothers feel that they can use the services of community well-baby clinics which are generally closer to their homes.

- Transportation to and from the hospital is often a drawback, especially for mothers with low incomes.

- Finally, there is the continuing problem of convincing each mother that she and her child are receiving some benefit from the research program. This is difficult because the program does not provide treatment for infants and children who are ill, unless such treatment cannot be given at the time by any other department in the hospital.

#### Devices to Encourage Cooperation

It was evident before data collection began that if participation in the followup clinic was to be at all representative, inducements would have to be offered to the mothers. Some of the following devices were decided on in advance,

while others were developed following experience in trying to maintain a high proportion of completed appointments.

- When an expectant mother was accepted for participation in the project, an attempt was made to record some telephone number other than her own at which she could be reached. This, theoretically, should have made it easier to trace mothers who moved and left no forwarding address.

- Efforts are made to accommodate working mothers and those with other young children. A relatively large number of Saturday appointments are scheduled for the working mothers. Mothers with children who are not enrolled in the study may bring them along with the participating sibling.

- Comforts are provided for the child who may have to wait his turn in the clinic. High chairs, toys, lollipops, and balloons rank high among the necessary items of equipment and supplies.

- As stated earlier, transportation to and from the hospital is provided whenever it is requested by the mother. This has proved a major inducement. In any given month, approximately 50 to 60 percent of all appointments kept are made possible through provision of transportation.

- Originally, no medical treatment was to be given to the participating children. It became apparent, however, that many mothers could see no advantage in continuing to bring their children. The program was therefore expanded to include a service phase providing on request a complete series of inoculations for the child.

- One of the most effective inducements has been the practice of mailing the mother a photograph of her child, taken at each appointment. Mothers may also obtain the negatives of these pictures. This practice was followed also by Moore, Hendley, and Faulkner (8). The photographs have been so effective in our study that many mothers now feel that they bring the child in "to have his picture taken."

#### Comparison of Active and Inactive Groups

The distribution of the active and inactive mothers by socioeconomic group is shown in

**Table 2. Percentage distribution of active and inactive mothers, by socioeconomic group<sup>1</sup>**

Socioeconomic group	Active (N=273)	Inactive		
		Moved outside city (N=43)	Moved within city (N=128)	Uncooperative (N=60)
I (low)-----	12.8	18.6	23.4	21.7
II-----	48.4	20.9	51.6	48.3
III-----	30.0	44.2	24.2	26.7
IV (high)-----	8.8	16.3	0.8	3.3
Total-----	100.0	100.0	100.0	100.0

<sup>1</sup> Socioeconomic data were unavailable for 19 cases. References 4, 6, and 7 describe the socioeconomic index.

table 2. The chi-square test (significant at the 1 percent level) indicates that there is some association between socioeconomic status and type of case. Approximately 60 percent of the mothers who moved outside the city are in the upper half of the socioeconomic distribution. This is perhaps a reflection of the fact that persons in the lower socioeconomic categories can ill afford to move from one city to another. The other three types of cases show relatively minor differences in their socioeconomic composition. The mothers who moved within the city and those who were dropped for lack of cooperation are perhaps more like each other socioeconomically than they are like the active mothers, but the difference is not outstanding. Variance analysis shows the association between socioeconomic status and type of case to be significant at the 1 percent level. The mean socioeconomic score falls in group II for all

cases except those mothers who moved outside the city, whose mean score falls in group III.

Comparative statistics on the background characteristics of the mothers are shown by type of case in table 3. Only socioeconomic status, discussed above, and education of mother are significantly associated with type of case. According to variance analysis, both factors are significant at the 1 percent level. Mothers who moved outside the city show evidence of higher socioeconomic status by having the highest mean educational attainment, 11.6 years. Education correlated more highly ( $r=0.665$  for all cases) with socioeconomic status than did any of the other factors being considered. Both the means and medians for educational attainment follow the same order as those for socioeconomic status, with mothers who moved within the city falling at the bottom. In both instances the active mothers are close in mean score to mothers moving outside the city, while the other two groups are similarly close.

Although no significant differences were found for age of mother and number of children by type of case, we again seem to have two sets of similar groups. For these two factors, the active and uncooperative groups are close in mean score, while there is very little difference in the mean scores of mothers who moved within and outside the city. Mothers who were dropped for lack of cooperation had the highest mean age and number of children.

Marital status of the mothers is shown by type of case in table 4. The chi-square test, applying only to the married and unmarried mothers, revealed no significant association be-

**Table 3. Comparison of active and inactive mothers, by age, number of children, education, and socioeconomic status**

Type of case	Age of mother (years)		Number of children			Education of mother (years)			Socioeconomic index	
	Mean	Standard deviation	Mean	Standard deviation	Median	Mean	Standard deviation	Median	Mean	Standard deviation
Active-----	25.5	5.9	3.0	2.0	3.0	10.1	2.5	10.6	27.2	12.0
Inactive:										
Moved within city-----	23.6	5.6	2.6	1.6	2.8	9.5	1.8	9.5	21.4	10.0
Moved outside city-----	24.1	4.8	2.5	1.5	2.6	11.6	3.0	12.2	30.3	13.4
Uncooperative-----	25.9	6.8	3.3	2.1	3.4	9.8	2.1	10.1	23.2	11.0

**Table 4. Percentage distribution of active and inactive mothers, by marital status**

Marital status	Active (N=276)	Inactive		
		Moved within city (N=133)	Moved outside city (N=46)	Uncoo- perative (N=67)
Married.....	78.3	72.2	76.1	62.7
Separated.....	3.3	4.5	2.2	3.0
Widowed.....	.7	.8	-----	1.5
Divorced.....	-----	-----	-----	32.8
Unmarried.....	17.8	22.6	21.7	-----
Total.....	100.0	100.0	100.0	100.0

tween these factors. Fewer of the uncooperative mothers were married, there being a very large divergence between this group and the active group. When only these two groups are compared, the chi-square test indicates an association between marital status and type of case which is significant at the 1 percent level.

#### Factors Presumed to Encourage Cooperation

Appointments kept by mothers who were active when their children were 36 months old are analyzed in relation to five background factors (table 5). Both the mean and median are discussed since the distribution departs significantly from normal distribution.

The mean number of appointments kept by all active mothers is 7.6 and the median is 8.7.

*Socioeconomic status.* The mean and the median number of appointments tend to increase as socioeconomic status improves, except for groups II and III which have the same mean and median. Regression analysis indicates a correlation ratio of 0.623.

*Number of children.* With one exception (table 5), the mean number of appointments kept decreases as number of children in the family increases. A somewhat similar pattern emerges when the median is used. Here a correlation ratio of 0.251 is found, indicating a lesser degree of association than exists between socioeconomic status and average number of appointments kept. The problem of maintaining the participation of mothers with several children has been discussed. Less difference than

might be expected is apparent, however, in the participation of mothers with one child and that of mothers with five or more children.

*Education of mother.* Of the factors for which correlation could be measured, education of the mother correlates most highly with average number of appointments kept. The correlation ratio is 0.764. Both the mean and median figures, however, show that the average number of appointments kept was greater for

**Table 5. Appointments kept by the active mothers in relation to socioeconomic groups and other factors**

Factors	Number moth- ers	Number appointments kept		
		Mean	Stand- ard devia- tion	Me- dian
<i>Socioeconomic group<sup>1</sup></i>				
I.....	35	6.2	2.6	6.8
II.....	132	7.7	2.2	8.9
III.....	82	7.7	2.2	8.9
IV.....	24	8.2	1.7	9.1
<i>Number of children</i>				
1.....	65	8.1	2.2	9.4
2.....	72	7.6	2.0	8.2
3.....	51	7.2	2.4	8.3
4.....	42	7.6	2.4	8.9
5 or more.....	46	7.0	2.6	7.8
<i>Education of mother (years)<sup>2</sup></i>				
Less than 8.....	47	7.0	2.5	7.8
8.....	46	7.2	2.5	7.9
9-12.....	142	7.8	2.2	9.1
College 1-4.....	40	7.7	1.9	8.4
<i>Age of mother (years)</i>				
15-20.....	67	7.3	2.2	8.0
21-23.....	64	7.4	2.2	8.2
24-26.....	45	7.5	2.3	8.7
27-29.....	45	7.2	2.6	8.4
30 or more.....	55	8.4	1.8	9.5
<i>Marital status</i>				
Married.....	216	7.7	2.2	8.9
Separated.....	9	7.7	1.6	7.0
Widowed.....	2	9.0	1.0	9.0
Divorced.....	0			
Single.....	49	6.9	2.4	6.4
Total.....	276	7.6	2.3	8.7

<sup>1</sup> Socioeconomic data were unavailable for 3 mothers.

<sup>2</sup> Amount of education was unavailable for 1 mother.



mothers whose schooling was completed between grades 9-12 than for those who had from 1-4 years of college. This deviation apparently is not great enough to mask a direct association between education and average number of appointments kept.

*Age of mother at delivery.* A slight degree of linear association between age of mother and average number of appointments kept was shown by regression analysis ( $r=0.1485$ ). Both the mean and the median increase with age. The differences are relatively small until the oldest age group (30 years or more) is reached. Half of the mothers who were 30 or older at the time of delivery had kept either 9 or 10 scheduled appointments.

*Marital status.* Significant association was found for marital status and average number of appointments kept, with the proportion being higher for the married mothers. The chi-square test was significant at the 5 percent level, using only the married and unmarried mothers. Those mothers whose marriages were broken were excluded from the correlation analyses because of the extremely small number, but comparative figures for them are included in table 5.

### Summary and Conclusions

Of a group of 523 mothers enrolled in a 5-year study in Nashville, Tenn., on the growth and development of Negro infants and children, almost half had become inactive by the third year of the study.

Comparison of the active and inactive mothers according to socioeconomic status, number of children, education, age, and marital status yielded the following results:

1. Significant differences exist between the four types of cases according to socioeconomic status and education of the mother. For both factors, the mothers who moved outside the city are highest on the scales. These mothers are closest in mean score to the active mothers.

2. Variations exist among the types of cases with respect to age of mother at delivery and number of children in the family, but these are not significant. For these two factors, however, mothers who were dropped from the study for lack of cooperation are closest in mean score to the active mothers.

3. When all of the categories are compared, no significant differences are found with regard to marital status of the mother. However, the proportion of unmarried mothers is significantly higher in the group of uncooperative mothers than in the group of active mothers.

With regard to participation of the active mothers as an index to cooperation, some degree of association was found for all of the background factors considered:

1. The strongest association between participation and any of the factors considered appears to exist for socioeconomic status and educational attainment, with mothers in the higher socioeconomic categories and the upper educational levels keeping more of their appointments.

2. Inverse association exists between number of children in the family and appointments kept.

3. Older mothers tend to keep more appointments than younger mothers, the difference becoming quite noticeable when mothers reach 30 years of age. However, mothers who were dropped for lack of cooperation had a mean age higher than that of any of the mothers, though not significantly higher.

4. Mothers who are married keep more appointments than do unmarried mothers.

In the final analysis, the degree of cooperation exhibited, as measured by participation, is a function of the person's maturity and feeling of responsibility as regards carrying through a commitment. The characteristics which are apparently allied with maturity and responsibility in the present context are also those which typify persons who move outside the city. This loss is, however, relatively small. Thus it would seem that if participation is to be representative of the various elements of the population being studied, extra inducements must be offered to those persons who do not possess the characteristics which seem to be allied with voluntary participation.

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## Plague Remains Modern Hazard

Vigilance against plague must not be relaxed, despite modern advances in fighting the disease, Dr. Karl Friederich Meyer of the University of California cautioned in his acceptance speech at the University of Chicago, where he received the Howard Taylor Ricketts Memorial Award for 1960 on June 6.

"What in 1928 was thought to be a localized epizootic entity in California," he said, "is now known to extend through 131 counties in 15 western States, an area comprising 40 percent of the continental United States from the Pacific Coast to the 100th meridian.

"During the period 1908-51, 98 cases (60 deaths) in eight western States have been contracted from wild rodents. There is every reason to predict that in that area, sporadic cases of bubonic plague may make an annual appearance."

Dr. Meyer, who is director emeritus of the George Williams Hooper Foundation for Medical Research and professor emeritus of experimental pathology at the University of California, attributed the special vulnerability in that State to the booming population. Although the building of suburbs will keep away appreciable wild rodent populations, he said, "There is an initial period of joint tenancy by people and wild and commensal rodents—a condition theoretically ideal for the propagation of plague."

Wholesale destruction of the diseased rodent population is not always possible as a preventive meas-

ure, owing to geographic and financial considerations, Dr. Meyer added.

Long thought transmissible only through rat fleas, plague is now known to spread through exchange of fleas of many wild rodents and other small animals, including ground squirrels, wood rats, chipmunks, prairie dogs, and field mice, according to Dr. Meyer.

Dr. Meyer traced the course of the plague in the United States since it was first diagnosed in a human in 1900 and in rats in 1902.

Plague reservoirs of rodents exist in South Africa, East Africa, Iran, and the Soviet Union. Soviet health workers have eliminated the danger on the fringes of their vast wild rodent area, but fear that plague may break out again or be reimported, Dr. Meyer said.

The sulfa drugs and the antibiotics have proved effective in treatment, allaying some of the panic caused by the appearance of human plague. Plague vaccines have been developed, but a dependable immunity cannot be achieved with a single injection, he added.

"Active immunization in the face of or during an epidemic is of little or no value, but a persistent long range vaccination program could serve as a supportive preventive measure." Modern chemotherapy is more effective in the vaccinated, Dr. Meyer believes.

# Gains in Outpatient Psychiatric Services, 1959

**O**UTPATIENT care for the mentally ill in the United States has expanded during the last 5 years in both the number of outpatient psychiatric clinics and the number of professional man-hours of clinic service. This conclusion is based on a comparison of data for 1954-55 (1) and 1959 from the nationwide statistical reporting program established for both governmental and nongovernmental outpatient psychiatric clinics by the National Institute of Mental Health in cooperation with State mental health authorities.

A net gain of almost 200 clinics increased the count of clinics in the Nation in 1959 to 1,429, an increase of 16 percent since 1954-55 (table 1). In addition to the opening of new clinics and the closing of others, the change also reflects some adjustment in the identification of outpatient psychiatric clinics. Clinics in existence but not identified in 1954-55 are now included; some clinics included in 1954-55 are no longer counted since it has been established that they do not satisfy the clinic definition. For reporting purposes, an outpatient psychiatric clinic is defined as "an outpatient mental health service unit with a psychiatrist in attendance at regularly scheduled hours who takes the medical responsibility for all clinic patients."

The number of clinic professional man-hours has increased at an even greater rate (37 percent). The number of professional man-hours is a better measure of the amount of clinic services available than the number of clinics because of the large number of clinics that are part time. Professional man-hours in 1954-55 totaled approximately 188,000 per week, with 1,178 clinics reporting; in 1959, this number had risen to 258,000, with 1,378 clinics reporting (table 1). The total professional man-hours reported include those of full- and part-time regular staff and trainees. The principal professional persons are psychia-

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## Highlights

A comparison of data for 1959 and 1954-55 shows gains in outpatient psychiatric clinic service:

1. The number of clinics increased from 1,231 to 1,429, an increase of 16 percent.
  2. Scheduled weekly professional man-hours of clinic service increased by 37 percent to 258,000 hours.
  3. The number of professional man-hours of clinic service available per week for each 100,000 population rose from 115 to 145.
  4. Every State now has outpatient psychiatric clinic services.
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trists, clinical psychologists, and psychiatric social workers, but other professionals, such as public health and psychiatric nurses, pediatricians, internists, medical residents, psychometrists, group workers, and technicians, are included. Subsequent publications will provide information on clinic man-hours by profession.

The growth of clinic service both in terms of number of clinics and professional man-hours is almost nationwide. Forty-seven States reported increased man-hours between 1954-55 and 1959; man-hours were doubled or more in 10 States. Only six States show a decline in psychiatric clinic services.

Differences in man-hours reported for the two periods may represent factors other than a true change in services available. Staff turnover affects scheduled weekly man-hours reported because the staffing on the "reporting day" may be a temporary situation (2). Possible errors in reporting, especially for the first reporting pe-

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*Prepared by the Outpatient Studies Section, Biometrics Branch, National Institute of Mental Health, Public Health Service.*

**Table 1. Number of outpatient psychiatric clinics, number of scheduled professional man-hours per week in reporting clinics, and number of man-hours per 100,000 population,<sup>1</sup> by State, 1959**

State	Total clinics <sup>2</sup>	Professional man-hours per week in reporting clinics		Professional man-hours per week per 100,000 population	
		Number	Percent change from 1954-55 to 1959 <sup>3</sup>	Number	Percent change from 1954-55 to 1959 <sup>3</sup>
United States.....	1, 429 (51)	257, 904	+37. 1	145	+26. 3
Alabama.....	13	1, 348	+384. 9	43	+363. 0
Arizona.....	5 (1)	550	+60. 3	45	+23. 4
Arkansas.....	3	1, 193	+178. 1	69	+184. 3
California.....	85 (1)	22, 626	+50. 8	158	+30. 8
Colorado.....	17	3, 598	+92. 2	218	+71. 9
Connecticut.....	41	6, 452	+71. 8	268	+57. 6
Delaware.....	7	604	-3. 2	135	-19. 1
District of Columbia.....	17	4, 698	+21. 3	574	+22. 7
Florida.....	29	5, 617	+59. 6	120	+12. 3
Georgia.....	11	1, 372	+132. 1	36	+116. 7
Idaho.....	1	100	-73. 0	15	-75. 4
Illinois.....	84	19, 353	+23. 3	191	+11. 9
Indiana.....	20 (1)	3, 524	+40. 0	76	+29. 2
Iowa.....	16	2, 242	+31. 4	80	+25. 2
Kansas.....	21 (1)	5, 200	+36. 0	247	+29. 2
Kentucky.....	19 (1)	1, 082	+78. 0	35	+68. 8
Louisiana.....	22 (3)	3, 404	+16. 1	108	+6. 4
Maine.....	8 (2)	358	+42. 1	38	+34. 7
Maryland.....	48	5, 111	+74. 9	172	+50. 3
Massachusetts.....	81 (7)	18, 248	+26. 5	372	+27. 0
Michigan.....	52 (6)	8, 685	+39. 5	109	+24. 9
Minnesota.....	16	3, 339	-13. 0	98	-19. 3
Mississippi.....	5	394	+79. 9	18	+73. 3
Missouri.....	48 (11)	4, 713	+56. 8	112	+51. 6
Montana.....	3	237	-40. 0	35	-45. 2
Nebraska.....	10	1, 041	+5. 7	72	0
Nevada.....	3	326	(4)	120	(4)
New Hampshire.....	22 (1)	605	-3. 5	104	-8. 8
New Jersey.....	57	7, 359	+30. 2	125	+17. 4
New Mexico.....	2	123	+53. 8	14	+44. 0
New York.....	303	61, 646	+14. 1	375	+10. 3
North Carolina.....	15	3, 554	+129. 4	80	+113. 9
North Dakota.....	1	161	+80. 9	25	+81. 3
Ohio.....	61 (10)	13, 475	+35. 8	139	+23. 6
Oklahoma.....	5	1, 214	+101. 7	54	+92. 2
Oregon.....	15 (2)	1, 156	+30. 8	66	+22. 6
Pennsylvania.....	103 (3)	18, 678	+91. 4	165	+87. 1
Rhode Island.....	9	1, 440	+16. 1	170	+10. 8
South Carolina.....	6	785	+5. 1	33	-1. 5
South Dakota.....	3	454	+124. 8	67	+121. 2
Tennessee.....	11	2, 720	+431. 3	78	+413. 8
Texas.....	30	4, 695	+55. 1	50	+37. 5
Utah.....	6	739	-25. 9	84	-35. 1
Vermont.....	6	512	+49. 3	138	+51. 5
Virginia.....	25 (1)	4, 685	+74. 4	121	+53. 4
Washington.....	12	2, 531	+98. 5	92	+77. 3
West Virginia.....	8	795	+28. 8	41	+30. 6
Wisconsin.....	21	2, 906	+54. 8	73	+41. 8
Wyoming.....	6	46	+53. 3	15	+40. 8
Alaska.....	7	237	+107. 9	151	+117. 0
Hawaii.....	7	1, 156	+56. 9	193	+29. 3
Puerto Rico.....	2	657	+128. 1	28	+116. 2
Virgin Islands.....	1	160	+595. 7	(5)	(5)

<sup>1</sup> Provisional population estimates from Current Population Reports, Series P-25, No. 210, U.S. Bureau of the Census.

<sup>2</sup> Includes independent clinics, clinics operated by State or local governmental agencies, the Veterans Administration, and nonofficial organizations. Number which did not report man-hours shown in parentheses.

<sup>3</sup> Source of 1954-55 data, reference 1.

<sup>4</sup> No clinics reported in 1954-55.

<sup>5</sup> Population estimate not available for 1959.

able 2. Rank order of States according to number of scheduled professional man-hours per week in outpatient psychiatric clinics for each 100,000 population, 1959

Rank	State <sup>1</sup>	Number man-hours per 100,000 population	Rank	State	Number man-hours per 100,000 population
1	District of Columbia.....	574	27	Utah.....	81
2	New York.....	375	28	Iowa.....	80
3	Massachusetts.....	372	29	North Carolina.....	80
4	Connecticut.....	268	30	Tennessee.....	78
5	Kansas.....	247	31	Indiana.....	76
6	Colorado.....	218	32	Wisconsin.....	73
7	Hawaii.....	193	33	Nebraska.....	72
8	Illinois.....	191	34	Arkansas.....	69
9	Maryland.....	172	35	South Dakota.....	67
10	Rhode Island.....	170	36	Oregon.....	66
11	Pennsylvania.....	165	37	Oklahoma.....	51
12	California.....	158	38	Texas.....	50
13	Alaska.....	151	39	Arizona.....	45
14	Ohio.....	139	40	Alabama.....	43
15	Vermont.....	138	41	West Virginia.....	41
16	Delaware.....	135	42	Maine.....	38
17	New Jersey.....	125	43	Georgia.....	36
18	Virginia.....	121	44	Kentucky.....	35
19	Florida.....	120	45	Montana.....	35
20	Nevada.....	120	46	South Carolina.....	33
21	Missouri.....	112	47	Puerto Rico.....	28
22	Michigan.....	109	48	North Dakota.....	25
23	Louisiana.....	108	49	Mississippi.....	18
24	New Hampshire.....	104	50	Idaho.....	15
25	Minnesota.....	98	51	Wyoming.....	15
26	Washington.....	92	52	New Mexico.....	11

<sup>1</sup> Excludes Virgin Islands, population estimate not available.

riod, 1954-55, may be an additional explanation for some differences.

To aid in determining the extent to which the growth in clinic services is keeping pace with needs for such services, the increase in man-hours must be related to changes in the population during the same time period. For the Nation as a whole, the number of professional man-hours of service available per week for each estimated 100,000 population increased from 115 to 145. All but a few States show some improvement in this ratio. The median State ratio was 88 man-hours for each 100,000 population in 1959 compared with 64 in 1954-55. The ratio continues to vary widely among the States, ranging from 14 to 574

(table 2). In part, differences are due to urban-rural patterns of services and the geographic distribution of medical and other professional training centers (1).

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## Translated Readings

The following items have been culled from the CIA *Scientific Information Reports*, distributed by the Office of Technical Services, U.S. Department of Commerce. Numbers following each item refer to the item and issue, in that order. All issues are from the PB 131891 T series.

### *Public Health Administration*

Mass aerogenic vaccination against anthrax was performed by Major General of the Medical Service N. I. Aleksandrov et al., experimentally in a hospital room with a volume of 40 cu.m., one window, and one door. From 40 to 50 persons, provided with seating and an intercom system, were vaccinated with three sprayers during each run. There were five series of vaccine from strains STI-1 and No. 3, with initial activity of 20-2,500 billion spores per gram. According to the activity of the vaccine, from 2 to 3 gm. were put into each sprayer, emitting 4 to 6 gm. into the room. Exposures ranged from 5 to 15 minutes.

In all, 363 men and women between the ages of 18 and 45 were immunized. In 1 to 3 weeks thereafter no ill effects were observed. Results of immunization tests were given in a table (not in the translation). It is concluded that spray vaccination makes it possible for a team of 5 or 6 to vaccinate 1,000 persons an hour (87, 32).

Plans for public health in 1960 in the U.S.S.R., outlined by S. V. Kurashov, Minister of Health, include construction of 2.4 million apartments and 1 million individual dwellings, graduation of 25,000 physicians and 68,000 "sub-professional" medical workers and pharmacists, and a 7 percent increase in public health expenditures. The Ministry urges the use of gamma globulin and vaccines to eradicate children's diseases such as diphtheria, whooping cough, and measles (145, 44).

A description of the system of medical services in Czechoslovakia, by E. Skrbkova, Moscow, reports absorption of social welfare depart-

ments by the health departments. The director of united therapeutic and preventive medical service of a rayon is also in charge of social welfare (84, 40).

Organization of public health institutions in Hungary, their history and functions, is described by Dr. Frigyes Doleschall, Minister of Health (85, 40).

Psychiatric rehabilitation in the U.S.S.R. is described by G. Martin, St. Joseph's Hospital, Berlin (160, 41).

### *Toxicity Studies*

A number of toxicity studies reported by U.S.S.R. scientists included reports by S. N. Golikov et al. on six derivatives of 1,3-amino-propanol; N. A. Zhilova, on benzene and acetone vapors; E. M. Bongard and V. F. Shlyapin, on ethylene oxide; L. A. Timofeyevskaya, on mono-ethanolamine; G. N. Zayeva, on anisole derivatives; and S. N. Kremnava, on bis-trichloramyl-sulfide. All authors are located in Moscow (117-121 incl., 45).

Toxicology of new chemical substances, with recommended tolerance limits, are published by S. N. Kremeneva et al., Moscow, for dichlorohydrin, nitrocyclohexane, silicochloroform, aminoanthic acid, and thiodivaleric acid (108, 46).

The toxicity of a trialkylthiophosphate insecticide, sold as Tinox, is reported by T. Hiepe and E. Seidel, Leipzig (110, 46).

Data on the toxicology of methylsystox, an organophosphorus compound composed of two isomers of dimethyl beta-ethylmercaptoethyl thiophosphate, is published by N. K. Statsek of Kiev (129, 44).

### *Occupational Health*

Industrial vibrations, their effects and preventive measures, are discussed by V. G. Trentyev, Moscow (69, 39).

A comprehensive list of the toxic gases, vapors, and dusts frequently found on industrial

premises, and the tolerance limits established by the chief State sanitation inspector of the U.S.S.R., are listed in a report by Z. B. Smelyanskiy and I. P. Ulanova, Moscow (83, 37).

Data on the action of low-intensity industrial irritants, both physical and chemical, with respect to the reactivity of experimental animals are offered by V. K. Narvotskiy, Khar'kov. Physical factors included chilling, heating, and ultraviolet irradiation; the chemical agents were benzene, aniline, nitrobenzene, lead (acetate), tetraethyl lead, carbon tetrachloride, dichlorethane, sulfur dioxide, carbon monoxide, and aviation gasoline (107, 45).

Prophylactic use of oxygen for industrial workers, as reported by Prof. Kh. Vaynshteyn, Chelyabinsk, began experimentally 4 years ago with men in varnish, dye, and chemical factories. Oxygen in 60 percent concentration was breathed for 45 minutes at the end of the working shift, for a period of 15 to 20 days. The treatment is reported to be in wide use in the industrial centers of the Chelyabinskaya Oblast (81, 34).

### *Infectious Diseases*

A direct method of obtaining a bacterial count for reservoir water within  $2\frac{1}{2}$  hours, said to be proposed in 1932 by A. S. Razumov, is recommended by L. Ye. Korsch, Moscow. A water sample is passed through a molecular filter which is dried, stained with erythrosin, dried again, and cleared with immersion oil. The organisms are counted by the immersion system with an ocular micrometer, and the number per milliliter calculated by formula (74, 33).

An improved, specific method of isolating types A, B, C, D, and F of *Clostridium perfringens*, on the principle of culturing suspect organisms between two indicator layers of agar, is detailed by B. D. Bychenko, Moscow (103, 44).

Experiments with aerosols of triethylene glycol and calcium hypochlorite to determine rate and duration of their effects on PR8 influenza virus, with white mice and chick embryos as hosts, are reported by Liu Yuan-yuan, Li Hant'ang, and Wang Chih-lum, Peiping (85, 42).

Microtechnique for rapid determination of bacteria by biochemical reaction is described by

Tseng Fan-chi, Peiping. Identification of pathogenic enterobacteria is achieved in 20 to 24 hours, in contrast to 4 or 5 days by conventional methods. The investigators find the technique preferable to the paper disk method of Sanders et al. (123, 41).

Studies of an outbreak of Q fever in Baku in 1956 suggest that the gray rat is possibly a natural reservoir of the disease, according to N. N. Sterkhova and M. G. Akhundov, Azerbaydzhan (77, 34).

*Rickettsia tsutsugamushi* were isolated from an adult tick, *Ixodes*, by Juan Kuang-lieh, I Ying-nan, and Kao Ling-i, Fukien Institute of Epidemiology, and Cheng Pi-te. Fuchow Army Health and Epidemic Control Stations (85, 32).

### *Basic Research*

A simple and precise method of calculating antigen-antibody reactions, as an aid to immunization studies, is the objective of a proposal by A. I. Nesterova, Moscow, to investigate the dielectric permeability of antigens, antibodies, and their suspensions. The authors describe one method of appraisal, with their data. The dielectrometer they diagram is based on the phenomena of resonance (92, 32).

Differences in light refraction between live and dead bacterial cells are the subject of experiments by B. A. Fikhman, Moscow. Bacterial specimens, in a clear gel prepared in distilled water, were examined in the immersion system of an MFA-2 anoptical microscope, capable of detecting changes in light refraction indexes lower than 0.001 (80, 32).

Rats with a high content of vitamin C in their tissues are relatively resistant to low-temperature effects, observes M. F. Merezhinskiy, Minsk (98, 34).

With the Krotov apparatus, G. I. Sidorenko, Moscow, performed 2,876 analyses of bacterial aeroplankton with samples taken at altitudes from 1.5 to 152 meters, November 1954 to December 1955 (102, 33).

Toxic properties of viruses are discussed by B. F. Semenov and V. I. Gavrilov, Moscow. The toxicity refers to the capability of viruses to cause pathological tissue changes which are not connected with the dispersion of the agent (162, 44).

# Program Notes

## **Radioactive Wastes**

Underground tank storage of highly radioactive liquid wastes is "not an ultimate solution," according to Dr. Joseph Lieberman, head of the Atomic Energy Commission's Environmental and Sanitary Engineering Branch, in an address prepared for the second sanitary engineering conference on radiological aspects of water supplies. Lieberman called for more research on ways of converting liquid wastes resulting from reprocessing of irradiated nuclear fuels into solids that can be safely disposed or stored for long periods of time and on systems for final disposal in specific geologic formations, obviating the use of tanks that eventually rust through.

There is not enough dilution available in nature, according to Lieberman, to allow the continual dispersal of these highly radioactive reprocessing wastes into the environment. He urged a vigorous effort to find absolutely safe and economical methods of disposition of the fission products from nuclear power reactors within the next 20 to 25 years.

## **Services for Migrants**

In Hollandale, Minn., 14 organizations joined forces in a community health project to hasten assimilation of migrant workers into Minnesota life.

At the request of the State employment service, a tuberculosis testing survey of the seasonal labor force needed and employed by local canning and refining industries was accomplished. Organizations participating included the Minnesota Department of Health, Freeborn County public health nurses and welfare board, physicians of the county medical society, the ladies aid societies of four churches, the Mineral Springs Sanatorium, the Minnesota State Department of Welfare, the Freeborn County Health Association, the Freeborn County

Tuberculosis Association, and the State Christmas Seal organization, as well as State and local employment services.

Of the 469 Mexican migrants from Texas surveyed, 238 persons were 15 years of age or older. And of these 238, 66.5 percent, or 158 persons, reacted positively to the tuberculin test.

## **Smoking in Pregnancy**

Infants whose mothers smoked regularly throughout pregnancy averaged 6 ounces less at birth than infants whose mothers were non-smokers, according to an investigation of 2,042 women delivered in 6 Birmingham, England, maternity hospitals. Dr. C. R. Lowe, in the *British Medical Journal*, October 10, 1959, said there were 1,155 non-smokers and 668 regular smokers in the group. The histories of 219 women were omitted because their smoking pattern during pregnancy had not been uniform.

## **Progress in St. Louis**

Metropolitan St. Louis, Mo., during the past 4½ years, has improved its sewage disposal system by establishing standard criteria for the design and construction of sanitary and storm water facilities, reviewing private and public sewage and drainage works to insure conformity with overall master plans, and centralizing its engineering inspection department.

## **Safe and Restful**

In an effort to anticipate consumer interests, manufacturers now assert that seat belts make driving more comfortable as well as safer and improve driving skill. Seat belts today, they also say:

- Reduce fatigue and strain.
- Do not wrinkle clothing, if properly worn.
- Are available for children, and are washable.
- Improve driving skill by assisting the driver to retain control in

sudden stops, minor collisions, quick turns, or unexpected road hazards.

The lifesaving quality of seat belts, proved in crash tests, on the highways, in aviation accident studies, and by U.S. Air Force tests, remains the basic advantage, provided drivers adhere to prudent speeds.

## **Dishwashing Detector**

A powder which detects hidden grease, starch, or protein films on "apparently clean" dishes has been developed at the University of Michigan School of Public Health in an effort to help sanitarians check dishwashing performance. The powder, a mixture of dry talc and dye, is sprinkled lightly on a dry dish which is then rinsed and drained dry. Red coloring on the dish indicates a soiled area.

## **Fallout Monitors**

New York State has set up what is believed to be the first early warning system for radioactive fallout. Automatic air monitors are installed at Buffalo and Binghamton, in Westchester County, and on Long Island.

## **Radiation Pamphlet**

The Rensselaer County Health Department in Troy, N.Y., has published "Radiation Protection," a pamphlet describing the procedures and techniques which reduce radiation hazards to patients and operators during operation of dental X-ray machines.

## **Restaurant Inspections**

To eliminate unnecessary duplication of routine sanitary inspections of restaurants and similar business establishments by three State agencies, Governor Nelson A. Rockefeller has delegated primary responsibility for these inspections to the New York State Health Department. The Governor ordered the labor department to end its inspections and the agriculture department to inspect only those restaurants not previously checked by the health department. The departments of health and agriculture will advise each other when one finds violations that come under the other's jurisdiction.



# Federal Publications

**Handbook on Programs of the U.S. Department of Health, Education, and Welfare.** 1960 edition; 229 pages; \$1.50.

This handbook brings together information about the program objectives of each major unit of the Department and the extent of the problem toward which the program is directed, the scope of the program, its legal basis, and related information. In addition, the volume provides for each program a 5-year summary of fiscal, personnel, and other statistics showing program dimensions and trends.

Available for the first time as a public document, the handbook is to be issued annually. It will be particularly valuable when used in conjunction with the annual report of the Department and "Health, Education, and Welfare Trends," also published annually by the Department.

Copies may be purchased from the U.S. Government Printing Office, Washington 25, D.C. Free sample copies are not available.

**Alcoholism.** *PHS Publication No. 730 (Health Information Series No. 97); 1960; 15 pages; 10 cents.* Briefly traces history of alcoholic beverages and explores some of the reasons people drink. Explains how alcohol affects the body and behavior. Describes symptoms of alcoholism and outlines methods of treatment and rehabilitation. Summarizes and interprets current research.

**The Dental Profession in the Midwest.** *PHS Publication No. 751; 1960; by Walter J. Pelton, Ruth Bothwell, and Helen M. Favra; 20 pages; 15 cents.*

Dental manpower in six midwestern States, Iowa, Kansas, Missouri, Nebraska, North Dakota, and South Dakota, is surveyed in terms of need and supply. The declining dentist-population ratio is noted, and the factors which produced it are discussed.

Two manpower projections show the deficits in dentist supply which the midwest will face in 1975. The first estimates the dental force needed to provide care for a larger population using dental services at a rate comparable to that which existed in 1958, and the second estimates the force required to meet the anticipated higher demand for dental care.

Text tables and charts provide data on the dental force and population of each State and the region as a whole.

**Introduction to Arthropods of Public Health Importance.** *PHS Publication No. 772; 1960; by Harry D. Pratt, Kent S. Littig, and Clarence W. Marshall; 35 pages; 30 cents.*

Arthropod-borne diseases and the ways insects and their allies affect man and domestic animals are discussed. Anatomy of arthropods and types of life cycles are described, and keys to classes and orders of arthropods of public health importance are given.

Twenty-five illustrations, a list of films, and selected references are included.

**Health Information for Travel in Europe.** *PHS Publication No. 748; leaflet.* Required and recommended immunizations are described. Included also are precautions on food and water consumption.

**Model State Vital Statistics Act.** 1959 revision. *PHS Publication No. 794; 1960; 30 pages.*

Drafted to guide States considering revision of their vital statistics laws, this model sets forth minimum principles, policies, and practices necessary to maintain an efficient and uniform vital statistics system in the United States.

The 1959 model act introduces major advances in vital statistics legislation. For example, with most births now occurring in hospitals, it places responsibility for preparing and filing birth certificates on hos-

pitals. Recommendations governing applications for delayed registrations, corrections of records, and penalties arising through fraudulent use of records have been greatly strengthened.

Copies of the 1959 act may be obtained from State departments of health, as well as the Public Health Service.

**Historical Roster of State and Territorial Health Officers, 1850-1960.** *PHS Publication No. 787; 1960; 40 pages; 60 cents.*

This roster is a chronological record, State by State, of the health officers under whom public health administration on a statewide basis was inaugurated and developed.

Brief historical notes tell about the origin of the early State boards of health. The introduction pays tribute to Lemuel Shattuck of Massachusetts, who delineated the pattern and precepts for public health organization in this country.

An appendix provides background information on the founding and organization of the Association of State and Territorial Health Officers.

**Sewage and Waterworks Construction, 1959.** *PHS Publication No. 758; 1960; 14 pages; 20 cents.*

Construction activity, as indicated by contract awards, in the areas of municipal water supply and municipal sewage disposal is summarized.

Data for various subcategories of construction are presented by major river basin, State, population size group, and contract size group. Similar tabulations have been published for the past 7 years.

**Biological Factors in Domestic Rodent Control.** *PHS Publication No. 773; revised 1960; by Robert Z. Brown; 28 pages; 25 cents.*

Identification of rodents, particularly Norway and roof rats and the house mouse, and their life history, behavior, and senses are discussed. Signs of rodent infestation and the ecological factors affecting rodent populations are also described.

An up-to-date list of references is provided.

**1959 Highlights of Progress in Research on Oral Diseases.** *PHS Publication No. 760; 1959; 22 pages; 15 cents.*

Directed primarily to dental public health workers, dentists, and dental educators, this booklet discusses activities at the National Institute of Dental Research, Public Health Service.

Studies on periodontal disease, caries, and other oral diseases and disorders are reported. Work in these fields by grantees of the institute is also described.

**Highlights of Research, 1959. Progress in arthritis and metabolic diseases.** *PHS Publication No. 753; 1960; 41 pages; 20 cents.*

Forty-three studies by the National Institute of Arthritis and Metabolic Diseases and by non-government research centers receiving support from the institute are described. These studies deal with rheumatic diseases, diabetes, gastroenterology, and basic research.

**Scientific Directory and Annual Bibliography, National Institutes of Health, 1960.** *PHS Publication No. 750 (Public Health Bibliography Series No. 30); 1960; 111 pages.*

Key personnel, staff members with doctorate degrees, and visiting scientists with tenure of a year or more are listed to reflect the organizational structure of the National Institutes of Health, Public Health Service, as of January 1960.

Scientific and technical papers published by the NIH staff during 1959 comprise the bibliography. Alphabetized by senior author, they are listed under the organizational unit to which he was attached when the work was done and indicate the accomplishments of each component.

**Procedures for Testing Pasteurization Equipment.** *PHS Publication No. 731; revised 1960; by Hugh E. Eagan; 43 pages; 25 cents.*

A detailed handbook on the methods of inspecting and procedures for testing milk pasteurization equipment is provided for the milk sanitarian.

This step-by-step outline, when used in conjunction with the laboratory phosphatase test and coliform

examination, should enable the control official to assure the public of a palatable supply of milk and milk products free of communicable diseases.

**Indians on Federal Reservations in the United States. A digest. Oklahoma City area and Florida.** *PHS Publication No. 615, Part 5; 1960; 34 pages.*

Data are given on Indian groups in the Oklahoma Indian health area, comprising Oklahoma and portions of Kansas, Mississippi, North Carolina, and South Carolina, and in Florida. Included is a brief description of location, ownership, and topography of reservation land, and a discussion on population groups and their social characteristics, with emphasis on homes, education, income sources, and health services and status.

**Domestic Agricultural Migrants in the United States (Map and Table).** *PHS Publication No. 540; revised 1960; 25 cents.*

To assist public health and other service agencies in identifying areas of migrant labor concentration so that they may plan adjustments in their programs to meet seasonal needs, the map indicates in round figures the number of migrants expected in each county at the peak of the crop season. The date of peak influx and the span of the crop season, as well as the number of workers and the total number of migrants, are tabulated for each county.

Data are given only for counties with 100 or more migrants.

**Nurses in Public Health. Number and educational preparation of nurses employed in the United States, Puerto Rico, and the Virgin Islands on January 1, 1960.** *PHS Publication No. 785; 1960; 52 pages.*

Based on data collected by directors of public health nursing in State health departments, this census includes nurses employed by State and local, official and nonofficial public health agencies, boards of education, and industries. The report should be useful to health agencies and professional organizations, universities, and national groups concerned with health manpower resources.

**Facts About the Professional Nurse Traineeship Program.** *PHS Publication No. 520; revised 1960; leaflet with two supplements.*

Long-term regular academic and short-term phases of the professional nurse traineeship program for administration, supervision, and teaching are described. The brochure covers basic information about the traineeships, eligibility requirements, and how to apply. Supplements list participating schools and sponsoring agencies.

**Proceedings, 1960 Annual Conference of the Surgeon General, Public Health Service, with State and Territorial Mental Health Authorities.** *PHS Publication No. 771; 1960; 48 pages.*

Reports on the manpower crisis in the mental health field and the planning of mental health facilities, summaries by 6 discussion groups on specialized programs, and 15 recommendations are presented.

The recommendations cover amendment of social security laws as they relate to type of illness covered and public assistance benefits, alcoholism activities, studies on the emotional problems of children, mental health information and education practices, mental retardation services and studies, and expansion of resources for school mental health programs.

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This section carries announcements of new publications prepared by the Public Health Service and of selected publications prepared with Federal support.

Unless otherwise indicated, publications for which prices are quoted are for sale by the Superintendent of Documents, U.S. Government Printing Office, Washington 25, D.C. Orders should be accompanied by cash, check, or money order and should fully identify the publication. Public Health Service publications which do not carry price quotations, as well as single sample copies of those for which prices are shown, can be obtained without charge from the Public Inquiries Branch, Office of Information, Public Health Service, Washington 25, D.C.

The Public Health Service does not supply publications other than its own.

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## REPORT UPON THE MICRO-ORGANISMS IN SCRAPINGS FROM THE NAILS OF SURGICAL NURSES.

HYGIENIC LABORATORY, U. S. MARINE HOSPITAL.

New York, November 18, 1889.

SIR: In accordance with your request of June 23, I have the honor to state that I have carried on a line of experimentation to determine the micro-organisms in the nail-dirt from the nurses of the surgical wards of this hospital.

Many observers have spoken of the danger of wound infection from this source: some have asserted that it was an impossibility to thoroughly cleanse the hands, more especially the nails, of operators and assistants.

Many plans have been devised, some of which are too tedious for application, to insure the perfect cleanliness of hands. Granting that this is accomplished on the part of the operator it does not, from our observation, apply to the surgical nurses and attendants of an operating-room.

In this investigation attention was chiefly directed to the hands of the surgical nurses and those having charge of or making surgical dressings. Observations were made from time to time, extending over a period of three months, the clientele of the wards constantly changing, so that a patient designated as a source of infection would not apply to the whole series.

The nurses had been, we believe, instructed to use the nail-brush and other agents for cleansing their hands. The usual method was as follows: Scrub the hands with soap and warm water to be followed by immersion in bichloride solution (1 to 3,000), the usual ward mixture for the surgical wards.

The examinations were so timed as to take the nurses when they were making or assisting in dressings, or just before an operation. In all the examinations only in two instances were the hands found to be sterile; in all the others bacteria were found.

To make the matter as clear as possible, we prefer to give the observations in detail and allow their results to speak for themselves.

NOVEMBER 22, 1889, pp. 393-398

Assistant Surgeon Joseph James Kinyoun, whose facilities for bacteriological analysis were in the one-room laboratory he established in the Marine Hospital, Staten Island, N.Y., reported on 26 examinations of nail parings from surgical nurses. Pus organisms were found in 16, *Staphylococcus pyogenes albus* in 10, *Streptococcus pyogenes* in 4, and *Staphylococcus pyogenes aureus* in 2. He concluded that, even with careful washing, "the hands of the nurse play a greater role as an infectious agent than is supposed."

# Recent Advances in Geriatrics

G. HALSEY HUNT, M.D.

A GREAT deal of confusion exists between two aspects of aging, the biological process of aging and aging as we commonly observe it in old people. To distinguish between the two, I suggest that we need both better definitions and new terms. For the past year or so I have been using the following definition of the biological aging process as the basis for my own thinking in this field:

"The biological aging process is the genetically and/or developmentally determined, progressive, and essentially irreversible diminution with the passage of time of the ability of a living organism or of one of its parts to adapt to its environment, manifested as diminution of its capacity to withstand the stresses to which it is subjected, and culminating in the death of the organism."

Some people consider that this is a defeatist and pessimistic point of view because certain beneficial things happen with the passage of time. This is true, of course, but let us call beneficial developments by some other name, maturation or development, for example, but let us not designate as "aging" everything that happens to a living organism with the passage of time. I think we will get much further much faster if we take a definition that makes the straightforward assumption that each individual's clock is sometime going to run down, and that it is going to run down regardless of the incidence of overt illness. Pragmatically, it is sometimes hard to distinguish the effects of illness from the biological aging process, but conceptually I think it can be done. There now

seems to be fairly general agreement that coronary heart disease or atherosclerosis should not be considered to be part of the aging process. Atherosclerosis occurs with increasing frequency with increasing years, but it is not part of the built-in mechanism of aging. It develops in early life in some people and essentially not at all in others.

I think that it would be particularly useful if we could develop a new name for the biological aging process, which would have fewer emotional overtones. For a time I thought "bio-entropy" would fill the bill, since this carries the implication that living organisms tend eventually toward disorder. When I suggested this to some of my scientific friends, however, I was reminded that "entropy" describes a state rather than a process and that we will have to seek further for the new word we need.

What we are really concerned with in the basic biological process of aging is the influence of the passage of time. Possibly "chronobiology" would serve as the generic descriptive term for the study of the effect of time on living systems. We then might use the term "anachronobiology" for the study of the processes of growth, development, and maturation, and "catachronobiology" for what I have defined previously as the biological aging process. These terms are admittedly clumsy, but as in legal phraseology, it is sometimes necessary to be somewhat clumsy in order to be precise.

## Scope of the Problem

The Bureau of the Census estimates that the total population of the United States on July 1, 1959, including Armed Forces overseas, was 177,103,000, of whom 15,380,000, or 8.7 percent, were 65 years and over (1). The population 65 years and over has increased by about 3.2

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million, or 26.1 percent, since 1950. There were 12.2 million persons 65 and over in 1950, and fewer than 9 million in 1940. During the 1950's, this group increased by about 350,000 each year, or nearly 1,000 every day.

In any context, the problems of 15 million people who constitute almost 9 percent of the population deserve respectful attention. In the practice of medicine, however, we are already faced with the fact that the great majority of fatal illnesses occur in mature individuals. The tremendous advances in medicine and sanitation in the last 50 to 75 years have largely eliminated the great scourges, the acute infectious diseases and tuberculosis, which formerly brought death to so many infants and children and young adults.

Fatal illness is becoming increasingly the prerogative of the older age groups. In 1955, 56.5 percent of the deaths in the United States occurred in people over 65, and another 25.8 percent occurred in people 45 to 64 (2). In other words, 82.3 percent of all deaths in 1955 occurred in people who were 45 or older. In 1920, only 50 percent of deaths occurred in this same age group. If we equate death rate with serious illness, which we can probably do with only minor reservations, four-fifths of all serious illnesses now occur in this age group. Already, therefore, all physicians except obstetricians and pediatricians have to pay more and more attention to people 45 and older.

### Geriatrics as a Specialty

This leads to the question of whether geriatrics should be developed as a separate specialty of medicine, complete with its own department in the medical schools. At present geriatrics is used rather loosely and usually refers to a sphere of interest rather than to a definitive specialty. Arguments can be advanced on both sides of the question as to whether or not it should become a recognized discipline. The principal arguments in favor of such a development are the sheer numbers of older people in the population and the fact that physicians and others have to be specially trained to give older people the proper attention.

The principal arguments against it are that

### Research Projects in Aging

"Activities of the National Institutes of Health in the Field of Gerontology" is published annually by the Center for Aging Research, National Institutes of Health. This is a compilation of research projects in aging carried out under National Institutes of Health research grants and projects conducted within the laboratories of the Institutes. The 1960 issue lists about 560 projects directly or indirectly related to aging, representing a total annual cost of \$12 million.

The research directly related to aging ranges from studies of the biological aging process to behavioral studies of older people, including studies of their relationships to their families, friends, communities, and jobs. The types of research classified as indirectly or secondarily related to aging includes cancer research, research in cardiovascular disease, arthritis, and other specific illnesses which are commonly found among the elderly.

most of the diseases and infirmities of age have their beginnings in middle life or even earlier (which leads some observers to conclude that the best "geriatrics" is practiced upon young and middle-aged adults); that it would cut across all established specialties except obstetrics and pediatrics; and that a "good doctor" for patients of 40 can be an equally "good doctor" for patients of 80 if he has the right attitude, which means giving them real attention and good medical care rather than just "tea and sympathy."

I have probably made it obvious that I lean strongly in the direction of not establishing geriatrics as a separate specialty, although in each community a few doctors may wish to identify their interests completely with care of the elderly and become known as geriatricians. I think all doctors except obstetricians and pediatricians should specifically concern themselves with studying and coping with the problems of the older age groups. They should all make specific efforts to prevent the development of disability insofar as this is possible and to treat disease and disability when they occur.

Although the aging process may be differentiated conceptually from disease processes, both

types of process should be treated. Physicians should treat the aging process by conditioning the patient psychologically to accept and live with the fact that he is aging and to make the most of his remaining abilities. Disease should be treated vigorously, not simply to prolong life, but to give the patient an opportunity for a better life. It is important that when disabilities (including senile brain changes) do appear, patients be given the benefit of modern rehabilitation techniques. These may be as simple as urging and assisting old people to get out of bed for a time every day—primarily to permit them to carry out the activities of daily living. Patients should be encouraged to exercise their minds and their bodies. Possibly the greatest single advance in the practice of geriatrics in recent years is recognition of the degree to which senile bedridden patients can be rehabilitated.

Since the health status of people in old age is largely the result of a lifetime of habits of living, it is important that we all study ways and means of getting people of all ages to adopt habits of living that will promote the highest level of health. I regret to say that even members of the medical profession are frequently lax in putting into practice what they know about the promotion of good health.

I should like to quote from a statement before the House Appropriations Subcommittee by Dr. Lewis Thomas, chairman of the department of medicine, New York University College of Medicine (3):

"What will it be like in the year 2000? In 1920 the year 1960 must have seemed like a tremendous distance away, but here we are. There are, in fact, more of us here now, in sheer numbers, than ever before in history. And if there is any certainty in human affairs today, it is the certainty that there will be still more of us, a staggering number of us, in 2000.

"I do not believe in the inevitability of human disease. There is nothing preordained about senile psychosis, any more than there was about childbed fever a century ago. Cancer is not a natural aspect of the human condition, nor is heart disease, nor epilepsy, nor heroin addiction, nor multiple sclerosis, nor insanity, nor blindness, nor any of the lists of maladies which plague us today. Aging

may be inevitable, and death is a part of nature, but disease is not, or needn't be, for humans. We have got to become a healthy species. This, it seems to me, is the task for medical research in the years that lie ahead, not for our own comfort, not for our remote posterity, but for the people who are the same distance from us in time as we are from 1920."

### Specific Advances in Geriatrics

Before discussing some specific recent advances that are more or less directly related to geriatrics, I should like to mention the recently published "Handbook of Aging and the Individual; Psychological and Biological Aspects." Some 30 authors contributed to this book, which was edited by Birren. It is a comprehensive readable compendium of existing knowledge about aging in the psychological and biological fields (4).

For the purposes of this discussion, I have picked a number of representative articles culled from those written during the past year or two by the scientists listed in "Activities of the National Institutes of Health in the Field of Gerontology, January 1959." These papers cover the principal groups of pathological conditions other than cancer, which is a large subject in itself. In addition, I am excluding all studies on the basic biological aging process. Let me describe these studies briefly.

#### *Atherosclerosis and Related Conditions*

Stamler (5), discusses the epidemiology of atherosclerotic coronary heart disease in an excellent summary article with a long bibliography. He comments that while it is perfectly correct to say that no one can definitively predict whether a given person will or will not develop clinical coronary heart disease within the next year or two, long-term prognostications of the actuarial type can be made. Some will be false positives or false negatives, but in general, high-risk individuals can be identified, with the consequent possibility of successful prophylactic intervention.

Based on recent investigations, it is becoming quite possible to estimate the chances of high-risk individuals in specific quantitative terms. It can be roughly estimated that a low-

risk middle-aged man, normal in weight, blood pressure, and serum cholesterol, has 1 chance in 20 of developing clinical coronary heart disease during the age period 45-64. In contrast, a middle-aged man with two or three abnormalities (obesity, hypercholesteremia, hypertension) stands almost one risk in two. These are markedly different risks.

The critical question is whether the risk in high-risk subjects can be prophylactically reduced by correcting defects. The defects are amenable to partial or complete correction by relatively simple medical-hygienic means, the decisive one being dietotherapy. It is not yet known definitely, however, whether the risk of coronary heart disease can be significantly lowered by correcting these defects, although the findings of the life insurance companies on the positive results of correcting obesity are highly suggestive in this regard.

O'Neal and co-workers (6) report that arterial thromboses with myocardial and renal infarcts occur in a large percentage of rats fed a known atherogenic diet to which are added large amounts of saturated fats. Thromboses occur before the formation of significant local intimal lesions, indicating that some hematologic factor is involved.

The same authors discuss the pathogenesis of atherosclerosis and myocardial infarction in a further report of their experimental studies in rats (7). Among 178 rats fed cholesterol, thiouracil, butter, and sodium cholate, 45, or 25 percent, developed myocardial infarcts.

Davis and associates (8) report studies of cholesterol synthesis in the human liver. They conclude that in man the liver supplies a relatively small part of plasma cholesterol, with the extrahepatic tissues being a much more important source than is currently generally believed.

Spain and associates (9) report on the effects of estrogens on resolution of local cholesterol implants. They found that intramuscularly administered estrone in rabbits and mice enhances the resolution of local subcutaneous implants of absorbable gelatin sponge saturated with cholesterol. This occurred in the absence of any alterations in serum cholesterol levels.

Davis (10) comments that the ability of the clinician to demonstrate objectively the pres-

ence of coronary disease with currently available techniques is severely limited. He describes the use of the ballistocardiograph in the diagnosis and management of patients with coronary heart disease, and stresses the value of the ballistocardiographic cigarette test.

Simonson (11) discusses the gravitational effects of postural changes. The changes of the extracranial volume pulse, recorded by means of an impedance plethysmograph, in tilted head-up and head-down positions, are significantly greater in older than in younger men, indicating impairment of circulatory postural regulation with age. Surprisingly enough, this impairment is partially compensated for in coronary patients, possibly due to hyperactive carotid sinus reflexes.

### *Mental Impairments and Brain Pathology*

Margolis (12) describes pathological observations in senile cerebral disease made with the aid of new techniques and includes a broad survey of the literature.

Obrist and Busse (13) describe the senescent electroencephalogram in a summary of findings on more than 1,200 elderly people. In healthy persons, the EEG undergoes definite but minor alterations with age, though the findings are not correlated with performance on intelligence, learning, or memory tests. In aged psychiatric patients, on the other hand, EEG alterations are more pronounced and there is a significant correlation with mental status. Psychiatric patients with normal or low blood pressure have more diffuse slowing than do those with mild hypertension. It is speculated that an elevated blood pressure may compensate for increased vascular resistance in old age, thus tending to maintain cerebral circulation and preserve a youthful tracing.

Loranger and Misiak (14) report on tests of critical flicker frequency and some intellectual functions in old age. They studied 50 female residents of homes for the aged, all between the ages of 74 and 80. Each patient was given the following battery of tests: critical flicker frequency, Porteus Maze, Wisconsin Card Sorting, Raven Progressive Matrices, Digit Symbol, and PMA reasoning. These particular tests of mental abilities were selected because performance on them declines markedly with age. All

the tests of intellectual functions, except the Porteus Maze, correlated significantly with CFF. The relationship of CFF and intellectual functioning in the aged is tentatively ascribed to a reduced central neural efficiency in old age, which adversely affects both CFF and some intellectual functions.

### *Collagen and Connective Tissue*

Lansing (15) discusses the role of elastic tissue in atherosclerosis.

Boucek and co-workers (16,17) discuss the properties of fibroblasts, especially with relation to the development of atherosclerosis, and the effects of sex and tissue age upon connective tissue metabolism.

Kohn (18) reports a histological study of the relationship of age to the extent of swelling of connective tissue in the human lung in acid. Connective tissue in pleura and around blood vessels in lungs from young individuals swelled more than in lungs from aged individuals. The distinction between young and old was most marked in connective tissue around blood vessels larger than capillaries and least marked in pleura.

### *Rehabilitation Evaluation*

It has long since been demonstrated, notably by Rusk and his associates, that intensive rehabilitation efforts will produce dramatic results in severely disabled individuals. Less is known, however, of the kind and amount of rehabilitation effort that is necessary to return bed-bound aged patients to a reasonable degree of self-care (or, preferably, to prevent their becoming bed-bound in the first place) and of the economic feasibility of providing various kinds and amounts of rehabilitation. Muller has made a preliminary report of the study that he and Tobis and others are carrying out to identify the kinds and amounts of rehabilitation activity that are desirable for patients in nursing homes, to develop measurements of the needs of the patients and of their improvement under treatment, and to determine the cost of various levels of treatment (19).

### *Osteoarthritis*

Silberberg and associates (20) report a study of sternoclavicular joints of 200 persons rang-

ing in age from the 1st to the 10th decades. They report that the incidence and severity of osteoarthritis in this series increased up to the age of 80 years. In individuals over 90 years of age, the incidence of severe arthritis was strikingly decreased. The lesions found in males were more severe than in females, and Negroes seemed to be more susceptible than whites. There was a positive correlation between osteoarthritis and diabetes and chronic renal disease, and between severe osteoarthritis and obesity. No correlation was found to exist between osteoarthritis and arteriosclerosis.

The relationship between arthritis and obesity did not seem to be based on mechanical factors. They report that hyperplasia and hypertrophy of the articular cartilage cells occurred early in the aging process, and the authors postulate that this may have some relationship to the development of osteoarthritis.

### *Thyroid Response*

Baker and associates (21) studied the responses to the administration of thyroid-stimulating hormone to two middle-aged men (aged 46 and 51) and three elderly men (aged 81, 88, and 92). Responses of the middle-aged subjects were not substantially different from those of the elderly men, and the available evidence, which is meager, does not support the contention that with advancing age there is a decreased responsiveness of the thyroid gland to thyroid-stimulating hormone.

### *Spinal Reflexes*

Frazier and associates (22) have measured spinal reflexes in rats. They find no significant changes in nerve conduction velocity with age, but do find an increase in central delay of the reflex. Histological analysis of 23 spinal cords in the lumbar region has been completed. The cell counts of the ventral horn show a steady decrease with age.

### **Conclusion**

As a final comment, I suggest that research on the biological aging process is not going to solve the problems of old age, important as it is in furthering our understanding of basic life processes. We cannot even be sure that re-



search on the medical and social and economic needs of old people is going to solve these problems, but we certainly need to know much more, not only about the factors which lead to eventual death, but what is more important, about those that cause the disabling infirmities of old age. We must find out which infirmities can be prevented and how they can be prevented. We must find out how aging can most effectively be managed in order to give our fellow citizens the best possible opportunity for a decent and worthwhile old age, so that as they approach their terminal years, they may best contribute to their own happiness, to their families, and to society at large. This is not a new idea, but it may be that we are finally approaching the time when we can better fulfill the concept expressed by the ancient Greeks, that the art of living consists in dying young—but as late as possible.

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# Some Aspects of Gerontology in the United States

STANLEY R. MOHLER, M.D.

TODAY in the United States the declining athletic prowess which accompanies aging, particularly after age 40, is far less significant occupationally to laborers as a group than it was two generations ago and earlier. This fact is a direct result of technological change, a development which, in effect, has provided the industrial energy requirements of the United States with calories derived for the most part from nonmuscle sources.

On the other hand, the laborer, white collar worker, professional person, and other categories of citizens find that although certain problems of aging, serious in 1900, are no longer so pressing, other problems have emerged which may in the long run prove far more difficult to resolve. Some will never be solved or compromised to the satisfaction of all.

## Health

Cardiovascular and cerebrovascular disease, of which atherosclerosis constitutes the most frequently found pathological change, is the leading cause of death in the age group over 65 years. Cancer is second. Together these conditions account for more than three-fourths of the deaths of older persons. Acute respiratory infectious diseases are next most numerous among causes of death, followed by the category of accidents. Falls, motor vehicle acci-

dents, and fires comprise 85 percent of the fatal accidents which occur among the aged.

Several usually nonfatal conditions are common among the aged. Periodontal disease is claiming most of the teeth lost after the age of 35. Cataracts in various stages of development are found in more than half of the individuals over 65. Almost all persons over 65 have some degree of hearing loss. Osteoarthritis is a cause of daily discomfort to many older persons and is particularly bothersome when it occurs in the hips and fingers. Osteoporosis, senile emphysema, and benign prostatic hypertrophy have their highest incidences, as expected, among the geriatric patients.

About 136,000 patients over 65 currently reside in State hospitals for the mentally ill, comprising about 30 percent of the patient load of these institutions. About 90 percent of these patients are diagnosed as "senile brain syndrome" or "arteriosclerotic brain syndrome." These diagnoses are far removed from schizophrenia and the affective disorders, conditions for which the institutions were originally established.

An important consideration in the mental health of the average older person is the fact that the United States has what sociologists have termed a youth-oriented culture. Apparently, the frontier-times respect for high physical capacity, associated with the ability to drop previous modes of life, break with tradition, and start anew, has not yet been replaced by other philosophies. This cultural milieu produces a feeling of inferiority in many older persons. It is thought that tendencies toward mental depression and hypochondriasis may arise on this basis.

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*Dr. Mohler is medical officer of the Center for Aging Research, National Institutes of Health, Public Health Service. The article is based on a paper presented at the Section on Geriatrics and Gerontology, Pan American Medical Association, Mexico City, May 4, 1960.*

The ease with which he becomes fat plagues the average person in the United States as he ages. It appears that the appetite is one psychophysiological phenomenon which does not decline with age, and it may even become unmanageable. Some have estimated that the average adult is 10 to 15 pounds overweight. The problem with such estimates is that no one has been able to define "ideal weight" adequately.

In the short-stay hospitals of the United States, there is about 1.0 hospital-day per person per year for the age group 25-64. For the age 65 and over bracket, this statistic is 1.8. Furthermore, those in the over 65 bracket stay an average of 15 days per hospitalization, while those in the 25-64 age group stay 9 days. In chronic disease hospitals, nursing homes, and related institutions the aged occupy the vast majority of the beds.

At present, various methods of meeting the medical expenses of the elderly are receiving national attention. It is apparent that a certain segment of this expense must be met by the community at large. Possibly the community may be able to cut expenditure considerably by investing in certain rehabilitation and home care programs.

### Income

Increases in technological complexity cause the older worker certain difficulties if he should seek a new job. It is quite possible to find that one's skills have become hopelessly outmoded after 30 years' employment in a given occupation.

Recently a congressional subcommittee observed that at least half of the aged in the United States cannot afford decent housing, medical care, or recreation. Also, fixed incomes after retirement, derived from pensions of various types, are often diluted by the effects of inflation.

### Retirement

After a life of busy, gainful employment, free time becomes a heavy burden for the retiree. A search for satisfying pursuits is facing most retired persons.

A number of retired persons are moving to

parts of the United States having warm weather the year around. Florida, Arizona, and southern California are the popular areas. We have not yet fully assessed the impact of such moves upon the retiree, particularly when the relocation means loss of touch with lifelong friends, family members, and familiar environments.

A critical factor in retirement is the matter of retaining a feeling of self-respect. When one is no longer a breadwinner, and particularly if one reverts to a dependency status, feelings of uselessness are apt to occur.

### Housing

The new high-rise apartment houses for the elderly may be ideal for some older persons, but certainly not for all. The absence of younger people may be disturbing to many. On the other hand, such facilities do provide a convenient constellation of potential companions.

Three-fourths of the persons over 65 in the United States live in what could be termed a family (living with a spouse, blood relative, or relative by marriage or adoption). Of the remaining older persons, one in five lives with nonrelatives, while four in five live alone.

Today's picture in regard to old folks homes and nursing homes has radically changed, when contrasted with the situation in 1900. The modern domiciliary institution, particularly the home for the aged, is not a refuge for the indigent. It is becoming a place where enlightened staff members counsel and assist residents in regard to various daily activities. The demand for such facilities still exceeds the supply.

### The Family

Three-generation families present complex social problems. The rapidly growing suburban areas, crowded with houses designed for two adults and two children and characterized by minute yards and inadequate recreational facilities, do not provide places for grandparents.

Nevertheless, it is true that many children must, upon reaching adulthood, take in their aged parents. The conflicts which often characterize such associations can have serious mental health consequences, particularly in societies with rapidly changing ideals. The young

adult's scorn for his aged parent's beliefs leads to intrafamily strain and feelings of misunderstanding and guilt.

## Research

The health-related aspects of aging are receiving the attention of numerous researchers. However, many believe that the gap between what we need to know about aging and what we do know is so large that much more research is required. To this end, the Federal Government has established various administrative components which spend full time on matters pertaining directly to aging. Many State and local governments have followed suit, and various private organizations which focus on aging have come into existence.

Last year the National Institutes of Health of the Public Health Service granted about \$12 million to various medical schools and universities for studies on aging. Other agencies and organizations also provided support for gerontological investigations. These efforts must

continue and expand, for, like the mythological Hydra, who, upon losing one head, would regenerate two, the solution of one gerontological dilemma results in others still to be resolved. Indeed, some of the individual's ultimate problems of aging will only be solved through death. In other words, rather than devoting our energies and philosophical efforts to endeavors which seek to attain that will-o'-the-wisp, agelessness, the Public Health Service is fostering the approach which seeks to preserve optimal well-being throughout the natural life of the individual.

Delegates of the States and territories of the United States will meet in Washington, D.C., for the White House Conference on Aging on January 9 to 12, 1961. This will be a nationwide attempt to further delineate current problems in gerontology and formulate recommendations for action. The postconference report to the President of the United States will summarize the information highlighted by the conference.

## Hearing Impairments in the United States

The relative frequency of hearing impairments in the United States rises rapidly with advance in age, according to a report by the U.S. National Health Survey on "Impairments by Type, Sex, and Age, July 1957-June 1958." The frequency increases in the following manner:

<i>Age period (years)</i>	<i>Rate per 1,000 persons</i>
All ages.....	34.6
Under 25.....	7.9
25-44.....	20.6
45-64.....	52.2
65-74.....	129.2
75 and over.....	265.4

More than two-fifths of the estimated 5,800,000 people in the Nation with impaired hear-

ing are 65 years or over, an age group constituting one-twelfth of the total population. More than half a million people under 25 years and nearly a million in the age group 25-44 years are affected by such impairments.

Other findings are that hearing difficulties are more common among males than among females; 40 out of 1,000 males have such impairments, a rate one-third higher than for females.

The higher prevalence rate for males may reflect their greater exposure to accidents and noise hazards in industry. In fact, the proportion of hearing impairments traced to injury is one-fifth among males compared with one twenty-fifth among females.

*Five types of cooperation tried successfully in various settings suggest paths by which hospital and nursing home relationships can be strengthened in the interest of better patient care and better community health planning.*

## Expansion of Cooperative Relationships Between Hospitals and Nursing Homes

ROBERT MORRIS, D.S.W.

**D**ESPITE a limited basis for optimism, the prediction that cooperative relations between hospitals and nursing homes will expand is justified, for nursing homes have become a major component of comprehensive medical care. They now provide more than 450,000 beds, almost as many as general hospitals. The services they can offer represent one way of meeting needs brought to light by such modern conditions as the growing importance of chronic and long-term illness, emphasis on active treatment of all illness, the increasing demand for forms of nursing and physical care that cannot be provided in private homes, and the rising cost of hospital and medical care.

Most of the development in nursing home care has taken place outside the mainstream of medical care and health organization, and it has not been much influenced by the health professions, except in regard to safety, sanitation, and minimum nursing standards. Nevertheless, it is recognized that hospitals and nursing homes can serve each other's purposes. We need to go further and ask how these institutions, which

are so different, can be brought together as partners in the same health-serving team. This partnership is essential if the words "continuity in medical care" or "comprehensive medical care" are to mean anything to patients, especially those with extended illnesses.

The difficulties of partnership are apparent if we consider the basic characteristics of these two organizations. The hospital is usually a nonprofit corporation, with a large number of beds, a rapid turnover of patients, a large professional staff of doctors, nurses, therapists and sometimes social workers, an administrative staff, a board of trustees, and wide support from the community through philanthropic gifts and government payments. The nursing home is usually a small institution administered by an individual for profit, with a nonprofessional staff supervised at best by a registered nurse and with occasional medical supervision. It cares for patients who stay for months and whose conditions change slowly, and it is dependent on current payments to keep going.

These real differences have been accentuated by unfortunate attitudes of doubt and suspicion. Hospitals have often complained about conditions of care in nursing homes: that simple physical and nursing care is poor, that patients are admitted who might be better cared for elsewhere, that they are kept bedridden unnecessarily. Nursing homes in turn have com-

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plained that hospitals are officious and authoritarian, that they refuse to share information about patients to be transferred or to plan in advance for their posthospital care, that they refuse to help the homes do those realistic things which can raise the level of care and still be within the reach of institutions with limited staffs or within patients' ability to pay.

Can two such different organizations really work together successfully? Experience in several communities suggests that they can, given a minimum of willingness to cooperate and to put aside suspicions of the past.

A willingness to work closely together implies sharing of purposes, agreement about common goals. In many respects these two institutions may have somewhat different goals. One is directed by the most advanced medical arts and sciences; the other, by the less complex aim of providing physical care. One is motivated by a desire to make sufficient return on investment; the other is concerned with keeping the deficit as low as possible. Despite these differences, both institutions care for sick people, and both can be interested in seeing that each patient receives the kind of care he requires, as measured by the best medical knowledge. Hospitals, as the community center for medical care, are, or should be, concerned with what happens to patients before and after their stay in the hospital; nursing homes are, or should be, concerned with the standards of good care.

Five general types of cooperation have been tried—tried successfully—but it must be confessed that they cannot yet be called typical, for there are still too few examples. The examples involve proprietary homes, nonprofit homes, hospitals, and public health or welfare departments, but the experiences of each may be useful for understanding the subject we are discussing. The five types of cooperation are: informal arrangements for transferring patients, training exchanges, joint planning for patient care, joint appointment of specialized staff, and administrative integration.

#### **Informal Arrangements**

An informal arrangement for transferring patients from hospitals to nursing homes is the

most common form of cooperation. The need to plan discharge of many hard-to-place patients is often so pressing that a member of the hospital staff, usually the social worker, must be on friendly talking terms with nursing home operators in order to locate the right home for a specific patient at the required time. Some hospital staff members, almost accidentally, know a number of homes well. They can advise families and physicians which ones are best able to give the kind of service required, and can locate vacant beds in an emergency.

This approach has been carried further in a few communities. For example, the St. Francis Hospital in Peoria, Ill., sometimes invites the nurse director of the Washington Nursing Home in Washington, Ill., to predischARGE conferences so that the home can share in the discharge planning and can make adequate preparations for the patients. The arrangement has worked so well that similar conferences are often held when nursing home patients have to be readmitted to the hospital for recurring active treatment periods.

The conferences have proved to be a wonderfully simple way to bring nursing home staff into the medical care team and to give them the feeling that they are an accepted part of medical care. The staffs of the two institutions can learn something about each other's way of working and thinking; a certain amount of teaching can take place, and a cooperative spirit begins to develop.

Such conferences, of course, are not necessary for every patient. They are especially useful when physicians prescribe treatment which is to continue after the hospital stay and which requires controlled care in a nursing home or periodic return to the hospital.

#### **Training Exchanges**

In some communities selected nursing homes are used by professional nursing schools or by schools for practical nurses to help train students. The homes are not affiliated formally with the schools, but are used as field resources. In some programs the students merely observe nursing home care; in others, they actually work in a home for a few weeks and carry out nursing or nurse aide duties under supervision.

Examples of nursing homes in which training programs operate include the Mahoney Nursing Home, Peoria, Ill., McKinney Nursing Home, Yonkers, N.Y., Manor Rest, Montrose, N.Y., and the Capitol District Home for Jewish Aged, Troy, N.Y.

These opportunities for observation or work in a nursing home enrich the student's experience and give her some knowledge of care in long-term institutions, where the tempo and objectives are so different from those of a general hospital. At the same time, they stimulate the nursing homes, which are necessarily on display, to do a better job. Careful advance planning between the nursing home director (usually a registered nurse) and the nurses' training supervisor is required so that new professional skill can be brought into the home. The result is that key staff get to know and trust each other, as well as to learn from each other.

Much in the experience of the nursing homes can be put to good use by hospital nursing staffs and the nursing profession, especially in regard to care of long-term patients. To cite one example, a recent series of field studies conducted in nonprofit nursing home programs for the aged revealed the fact that bedsores were no problem even for patients who had been bedridden for long periods. Yet when some of these same patients were transferred to a hospital for treatment of 10 days or 2 weeks, they returned with new bedsores. The explanation probably is found not in "bad" nursing as measured by general hospital nursing standards, but in the difference in nursing technique for short-term and long-term patients, a difference about which nurses in general hospitals may have something to learn.

Another kind of teaching exchange arrangement has been tried in several communities between public health or public welfare departments and nursing homes. In one form the public agency employs nursing educators, occupational and physical therapists, and social workers to help interested nursing homes train their own staffs in modern concepts of rehabilitation and patient care. Examples are found in the State program of the Illinois Public Aid Commission and the local program of the Erie County Health Department, Buffalo, N.Y. The specialists, available at the request of the

nursing home, are prepared to instruct either the nursing supervisors, nurse aides, or attendant staffs in new techniques. Even though home staffs change rapidly, it is hoped that a core of workers will be trained over a period of years.

The advantages of this arrangement can be very great. Nursing homes are usually too small to provide the kind of continuous on-the-job training which medical and nursing care seem to require. A public agency, or for that matter a hospital, can use some of its training staff to raise the standards of nursing home care. This educational approach can be especially important in helping nursing homes apply new knowledge about rehabilitation through which disabled persons are helped to maintain the level of self-care they have reached after active treatment under medical control.

A variation of this approach is based on the belief that small nursing homes cannot ever provide the services of specialists which proper nursing home care requires, except at exorbitant cost to the patient. Such care, based on the most advanced principles of comprehensive medicine and rehabilitation, requires a variety of skills and equipment for a variety of special patient conditions. To meet this situation, some health departments employ nutritionists, physical therapists, occupational therapists, and social workers to give direct service to patients in nursing homes, following physicians' prescriptions. With this help the cooperating homes can expand and upgrade their services as well as increase the skill of their own staffs. These programs have sometimes been started with a minimum of organizational superstructure. One health department employs a team of specialists to work a few hours a week in nursing homes. However, even the most informal plan has required someone to arouse interest among nursing home operators and to overcome their suspicions.

Providing specialists' services is still experimental, and it remains to be seen whether, in time, the nursing homes can support these services on their own. There are several possibilities along this line. Groups of nursing homes may want to pool their own funds to employ specialist staff for their joint use, or public health and welfare agencies may want to

continue to provide such staff as a community service. These programs are, after all, a natural extension of the licensing function now carried on by these public departments. They mean that the department not only sets standards, but goes ahead realistically to help nursing homes achieve those standards in daily practice.

Alternatively, general hospitals may want to enter into similar arrangements with one or a group of homes which their patients use. It might seem that this undertaking would overburden hospital staffs and increase the already high cost of hospital care, but actually it may prove less costly than inadequate care which results in hospital readmissions or unnecessarily prolonged disability.

There are many other ways in which hospitals can share information and help raise nursing home standards. A number of nonprofit nursing home programs for the aged have obtained expert help from hospitals in rebuilding their facilities, in planning kitchen layout and organization of food service, and even in recruiting nurses or nurse aides. There is little reason why similar arrangements cannot be extended to the proprietary field.

### Joint Planning for Patient Care

Joint planning between a hospital and a nursing home may seem like an effort to pair off a dwarf with a giant but it has worked. A recent study of 10 cooperative programs between general hospitals and nonprofit homes for the aged indicates several ways in which joint planning can benefit both types of institutions. This study was part of a large-scale inquiry into coordination of health services for patients with long-term illness conducted by the Council of Jewish Federations and Welfare Funds. The institutions were located in St. Louis, Chicago, Cincinnati, Philadelphia, Baltimore, Troy, N.Y., New York City, and Toronto, Ont.

The key to the cooperative programs was development of mutual confidence and trust. In every instance, the institutions began with a massive distrust of each other and skepticism that anything could be done that would not serve one institution at the expense of the other. The hospitals were convinced the homes gave sub-

standard care and did not want to improve. The homes were certain the hospitals only wanted to "dump" difficult patients and didn't care what happened to them, or feared the hospitals wanted to swallow up and dominate the administration of the homes.

Despite these obstacles, the 10 projects demonstrated several areas in which the work of these institutions could be planned jointly with beneficial results for the patient in the form of continuity in care and improvement in services in both institutions. This joint planning has been carried out with strict regard for the administrative and financial independence of the nursing homes, and all steps were taken by mutual agreement.

A major achievement was agreement about transfer of patients between hospital and nursing home. This means that the hospital must determine exactly what each patient needs in the nursing home and share the information with the nursing home staff in advance of discharge. Those who need much help to retain their physical functioning are sent only to homes able to give such care. Those who need to progress gradually from bed to ambulation are sent to homes with staff able to follow this cycle. Those with mental complications are sent to homes capable of coping with the extremes of human behavior. These arrangements also provide for emergency or planned return of patients to the hospital without delay. In effect, the nursing homes are assured of priority hospital admission for certain classes of patients.

The cooperation has gone further in several communities. Prescribed regimens of physical or occupational therapy, clinic treatment, and continuing diagnostic studies for nursing home patients are carried out by physicians who use the hospital resources just as freely as if the patient were still in the hospital. The hospital laboratory does diagnostic work on request; occupational therapists or physical therapists give treatment as prescribed. All the special facilities of the hospital are immediately available to the physicians who supervise the patients in the nursing home. There is no need to delay treatment because it is hard to get, because the home does not have the resources, or because no one wants to readmit the patient



to a hospital bed. Usually transportation back and forth must be arranged, although in some communities the hospital staff visits the nursing home regularly as if it were an extension of the hospital, especially for certain mobile laboratory and treatment procedures.

Initially, there was fear that these arrangements for sharing services would lead to abuses of the hospital's overbusy staff, but the fears have proved unjustified. Moreover, the arrangements have produced an unexpected side benefit. Previously, a significant number of patients were readmitted to a hospital because the nursing home could not provide proper care or because there was not enough medical backing to give the home confidence that it could safely care for these patients. In the joint programs, many such patients were satisfactorily cared for in the home, with the assurance of hospital backing as needed. The result was a decreased demand for hospital readmission and a less-than-predicted demand for outpatient services.

### Joint Appointment of Key Personnel

Joint planning for patient care has sometimes led to another level of cooperation, joint appointment of key personnel. The crux of the 10 plans studied has been a growing unity in medical and nursing understanding. As this developed, administrators of the two kinds of institutions were able to agree about the physicians and nurses who could work together. Several nursing homes (for example, the Lucien Moss Home, Philadelphia, the Jewish Center for the Aged, St. Louis, and the Beth Abraham Home, New York) have consulted hospitals about selection of a physician to serve as medical supervisor or director of the home's medical program. In each instance the home chose its physician from the active hospital staff, and more important, chose him with the advice of either the hospital director or the chief of the hospital medical service. In at least two nursing homes (the Lucien Moss Home and the Jewish Center for the Aged) the nursing supervisors have been drawn from the hospital nurses' teaching staff, on the basis of consultation with the nursing director.

These steps must seem like a radical develop-

ment, and I cannot emphasize too strongly that they were taken because both nursing home and hospital wanted them. Both agreed to them voluntarily without any loss of independence in control of their own policies. The hospitals needed a nursing resource in which they could have complete confidence, and the homes were able to improve their care at minimum cost by drawing on the resources of a hospital.

In a few instances cooperation has gone still further, to full integration wherein the hospital takes over the administrative and financial control of a nursing home and operates it as an arm of the hospital. This may prove to be a useful path for future development, but it cannot soon affect the thousands of independent nursing homes, both proprietary and nonprofit, which will continue to exist as independent organizations.

### Conclusion

The five major types of cooperation—informal arrangements for patient transfer, training exchanges, joint program planning, joint appointment of key staff, and administrative integration—suggest several paths by which hospital and nursing home relationships can be strengthened in the interest of better patient care and better community health planning. They are practical means by which a vast new resource is added to the community health team. Nursing homes are already a significant factor. There remains the task of learning how to bring them into the medical care family, along with physicians, nurses, hospitals, health departments, social agencies, and others.

We have relied for a long time on licensing and control as a way to work with nursing homes. These examples point a new way, the way of cooperation and mutual help, to close the gap between these two sectors of our medical organization.

What we now require is some center or impetus in every community and in every State to encourage the widest spread of these tested methods for voluntary cooperation. Hospital associations, medical societies, public health and welfare departments, health councils, and associations of nursing homes are equally suitable leaders. Which will take advantage of the opportunity?

# Health and Welfare Services for the Aged

ALBERT L. CHAPMAN, M.D.

AS AGE progresses, tissues tend to dry out and the skin tends to wrinkle; cells atrophy and degenerate; the metabolic rate is lowered; reaction time decreases; and the repair of damaged tissues is slowed up. But the aging process proceeds at a slow pace in most people. It is particularly retarded in those who live moderately and plough back into their lives some of the profits of healthful living.

Excesses of drinking, eating, smoking, and worry, too little sleep, exercise, and relaxation—these are the tubercle and diphtheria bacilli, the streptococci and staphylococci of old age. These are the factors that invite premature degeneration of the mind and body. Yet these are the very factors over which everyone has considerable personal control.

A second characteristic of older people is poverty. Eighty percent of those over 65 have a cash income of less than \$2,000 a year; 60 percent have less than \$1,000 a year.

And the incidence of chronic illness, as one would expect, rises rapidly with age. That is why older people use hospitals more frequently than younger people and go to physicians more often. This compounds the economic plight of oldsters. In the last decade the rise in the cost of hospital and medical care has outstripped even the rapid rise in the overall cost of living.

## Characteristics of Long-Term Illness

The chronic diseases, often called long-term illnesses, are different in many ways from the acute infectious diseases which have been brought under substantial control since 1900. But two outstanding differences have a distinct bearing on the problem we are now considering.

First, the chronic illnesses are characterized by a long latent period when the existence of disease usually is unknown to its victim. However, this is the period when screening procedures, in many instances, can unmask the disease so that physicians may initiate treatment early.

The second difference is that chronic diseases are characterized by their chronicity. To be specific, if a 35-year-old woman is found to have diabetes or heart disease, she must learn to accept the fact that she will have the disease until she dies. This does not mean that she will be sick the rest of her life. She may, and usually does, live a fairly normal life. That will depend to a great extent on her willingness to face up to reality, to accept the fact that she will need continued medical supervision throughout life and that she will have to live within the limits imposed by her disease.

## Preventive Approaches

There are four approaches to the prevention of disability and premature deaths from chronic illness which, in a sense, are time oriented.

The first of these I call "preventive living." This term is derived from that familiar phrase "preventive maintenance" so often applied to the care of equipment in order to extend its period of usefulness.

All of us have weak links in our chain of

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*Dr. Chapman is Assistant Surgeon General and chief of the Division of Special Health Services, Public Health Service. The paper is based on an address to the Virginia Council on Social Welfare at Roanoke, April 27, 1960.*

life, weak links with which we are born and which we have inherited. Therefore, we are more susceptible to one type of disease than another. One person may be prone to develop high blood pressure, another diabetes, and another rheumatic heart disease.

It is important, therefore, to make it a practice to go to a physician at periodic intervals throughout life so that he may have the opportunity of detecting these weak links as early as possible. As ideal as an annual physical examination sounds, it would be impractical for everyone to have a physical examination every year. There wouldn't be enough doctors to go around. However, a thorough checkup every 5 years before age 40, a 3-year checkup from 40 to 60, and an annual checkup thereafter would go a long way toward keeping everyone fit and cutting down hospital and medical bills. Physicians would see more patients, but they would see each patient less often.

Certain habits are harmful to everyone regardless of the nature of the weak links in the individual's chain of life. Obesity has been strongly indicted as a precursor to many chronic diseases. With the increasing popularity of alcoholic beverages and their more widespread acceptance as social trappings, the incidence of alcoholism is increasing and with it cirrhosis of the liver. Heavy smoking as well as air pollution has been linked with an alarming increase in lung cancer. Peptic ulcers are said to affect 10 percent of the American people at some time in their life. Worry, emotional stress, bad eating habits, lack of sleep, all these are suspect. Hypertension has been linked with living habits as well as heredity.

The list of correlations between specific chronic disease states and immoderate living is almost endless. That is why I place so much emphasis on the importance of preventive living, particularly during adult life. At a time when science has not yet determined the specific causes of heart disease, cancer, strokes, or high blood pressure, people must learn to help themselves. There is a limit to what the doctor or the health officer can do for them.

The growing appreciation of the need for periodic health examinations and the increasing number of older people places a heavy demand

on the time of overworked private physicians. Unfortunately as the demand for preventive health examinations grows, the number of physicians per thousand people is decreasing. To take up some of the slack, more screening examinations are being done, not to substitute for comprehensive physical examinations performed by physicians but to supplement them.

Only a limited number of diseases and conditions can be detected by screening examinations, but, in a growing number of States and localities, these examinations are sending thousands of people who had no idea they had a chronic illness to physicians for diagnosis and treatment.

### Care and Rehabilitation

The lack of financial resources of most old people, the chronicity of their ailments, and their natural preference for care at home have been documented over the years. As a result, growing importance has been attached to the development of methods that will make it possible to take health services to old people in their own homes. For example, more and more local health departments are providing bedside nursing services, and in Person County, N.C., and in many large cities the value of home care programs has been demonstrated. The newly recognized category of homemaker is being grafted into health and welfare teams in a growing number of communities.

Through the efforts of the American Nursing Home Association and other interested groups the quality as well as the quantity of nursing homes is being raised year by year. If adequate financial support is provided for the care of guests in nursing homes, reasonable and humane minimum standards of care can be developed. But in many States, welfare payments are not sufficient to meet the costs.

The mounting toll of needless disability among the aged caused by strokes, arthritis, and fractures has focused the attention of medical and public health workers on the need for more extensive early rehabilitation services. Many of the permanent disabilities among older people should never occur. These disabilities which keep many old people from working and from caring for themselves could be prevented

if early rehabilitation services were made available. Private physicians with the assistance of public health nurses and physiotherapists, where they are locally available, are now providing disabled patients with rehabilitation services in their own homes with a considerable degree of success.

### **Fiscal Considerations**

In considering how to pay for the many new types of health services that will be required by the aging population, it may be well, in deference to accepted patterns of providing medical care, to discuss the care of indigents and non-indigents separately. About 60 percent of people over 65 are now receiving old-age and survivors insurance benefits, and an additional 10 percent are dependent upon public assistance.

These people, with such limited incomes, can pay for needed health services only with great difficulty if at all. Very few of them are included in the one-third of the "over 65" population able to purchase voluntary health insurance. As time goes on, a larger percentage of old people probably will be enrolled in voluntary health insurance plans, and the percentage of those who will be covered by private pension plans, in addition to OASI, will increase significantly.

It is even conceivable that public opinion will evolve to the point where retirement income will be set at approximately the level of peak individual income. In other words, old people will not be penalized for simply growing old. One of the commonest fallacies extant today is the belief that old people don't need money. This belief, in my opinion, represents selfish rationalization on the part of adults who have no desire to share their income with the aged. It may be seen then that we can look for a gradual improvement in the ability of old people to purchase the health services they need, but the problem in no way will be solved in this fashion.

One service that can be provided without violating present concepts of medical care is the supplementation of health services to indigent ill persons by State and local health and welfare departments working cooperatively with private physicians. State and local health depart-

ments should and must become much more deeply involved in the administration of existing medical care plans for indigent ill persons. The belief that to do so might incur the misunderstanding of the medical profession is no longer justifiable. Many health officers still parade this belief in order to avoid taking on additional and sometimes burdensome responsibilities.

State and local welfare departments must find ways to provide and finance more preventive types of health services for older people. More screening services for adults and aged could pay large welfare dividends. More rehabilitation services could increase the earning capacity of disabled indigents and decrease the need for providing them with costly personal care services. More home care services could lower the level of hospital bills for indigent ill persons.

Any improvement in health services for the indigent segment of the population will be reflected in an improvement in the quality of care given by private physicians, hospitals, and health departments to the nonindigent population. Good medical practices like good manners are contagious. State and local health departments can provide many ancillary health services if the need for such services is recognized by private physicians and if a willingness is shown to use them.

In supervising the care of old people with disease, strokes, diabetes, fractures, and arthritis, many supplemental services, badly needed by private patients, could be more economically provided by nonmedical persons. Nutritionists, nurses, physiotherapists, social workers, and technicians have skills and competencies which could be invaluable to overworked physicians who often labor singlehandedly. These skills, if added to local health or welfare department staffs, could be made available to assist private physicians in the care of their chronically ill patients. This could be done and has been done in such a way as not to abridge traditional doctor-patient relationships.

### **Coordinated Community Care**

The growing sophistication of health services for the aged, the increasing complexity of

community patterns for providing these services, and the multiplicity of agencies purveying them have combined to create an urgent need for a better coordination of community care services. In New York City more than 3,000 different agencies, official and nonofficial, provide health care. In one city of 500,000 recently studied, more than 500 health agencies were identified. Even in remote rural counties the number of agencies interested in the provision of health services rarely drops below 25. This too often means that agency services are provided in an uneconomical and ineffective fashion. Duplication is rife.

In several communities leadership has evolved. Agency representatives have met. Health needs have been identified. Health resources have been tabulated. Gaps in health services and facilities have been documented. In this way, the duplication and overlapping

of health services is being reduced to a minimum.

The need for services is growing so rapidly and the resources are so relatively few, none can afford to be wasted. It matters less who takes the lead in stimulating the development of such a plan than that such a plan be developed. In one community, leadership may evolve from the medical society; in another, leadership may arise in welfare or health departments; or voluntary health agencies may take the lead.

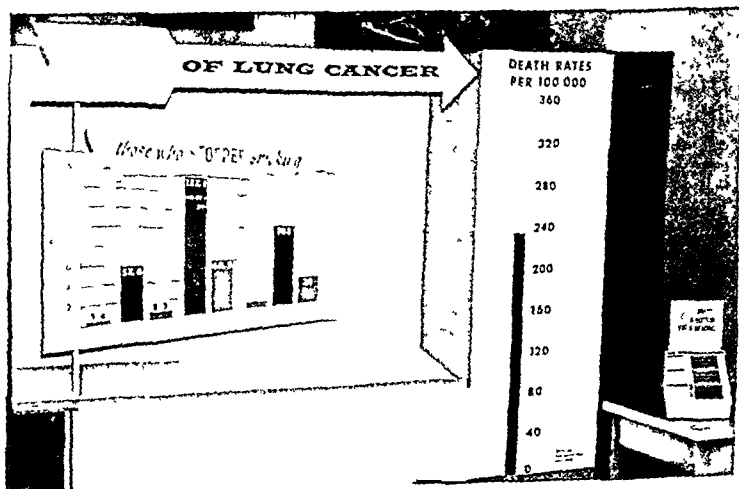
Aging has moral, economic, health, and social facets. The fact that there is a problem of aging is indeed fortunate, for it stems from the scientific successes which brought the dreaded infectious diseases under substantial control and which promise in the years ahead to ameliorate the ravages of such diseases as heart disease, cancer, and arthritis.

## exhibits

### Risk of Lung Cancer

The risk of developing lung cancer according to the number of cigarettes smoked and the age of the smoker, as well as the lessened risk for the ex-smoker, is depicted in this exhibit. It features a thermometer with an accompanying pushbutton panel control box containing 12 buttons arranged according to number of cigarettes smoked and age group (55-59, 60-64, and 65+ years). When a button is pressed, a column of lights in the thermometer reveals the death rate per 100,000 population for the appropriate category. The figures presented were derived from studies by Dorn, by Hammond and Horn, and by Doll and Hill.

Available on loan from the Cancer Control Branch, Division of Special Health Services, Public Health Service, Washington 25, D.C., the exhibit must be requested



**Specification: (No. CC-5)** A free-standing exhibit, 7 feet high and 8 feet wide, total weight 475 pounds including packing crates. Lighting fixtures require one 1,500-watt outlet. Column of lights is seen to best advantage when booth is 10 feet deep, or wide enough to prevent table on which the panel control box sits from interfering with spectator's view.

at least 1 month before the date desired. The branch will pay all costs of shipping and installing at large national and regional meetings, but for smaller meetings of primarily local interest these costs

must be borne by the borrower. Instructions for assembling the exhibit are attached to the inside door of each of its two packing crates. It can be assembled by two men in 30 to 45 minutes.

# Health for Older People

Guidelines to promote the positive health of older people emerged at the 1960 National Health Forum, sponsored by the National Health Council, held in Miami Beach, Fla., March 14-17, 1960. Approximately 600 authorities from health, medicine, education, religion, government, social welfare, industry, and labor participated. Following are summaries of five papers indicating some of the achievements and promises of research on aging and the potentials for extending healthy and satisfying life.

## Current Research on Aging

**brief** Medical research, having prolonged life, seeks to maintain the functioning efficiency of the aged person's body and mind. To fulfill this aim, the physician seeks to distinguish the cause and course of diseases from irreversible senescence.

Atherosclerosis is a good example of the opportunity for such distinction. Long thought to be an aging process, it is now considered a metabolic disorder. As the causal process in coronary artery disease and cerebral vascular disease, it is ultimately responsible for most strokes and heart attacks. Current research in atherosclerosis, mostly biochemical or metabolic in focus, is essentially directed at preventing atherosclerotic changes. Clinical assessment of the degree of atherosclerosis is basic; detection is rare until the function of some vital organ has been impaired. At present, none of the various therapeutic interventions attempted has proved of value.

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*Based on a paper by Ewald W. Busse, M.D., chairman, Department of Psychiatry and Council on Gerontology, Duke University Medical Center, Durham, N.C.*

Surgery has been the most rewarding method of correcting atherosclerotic blood vessels. Replacing diseased segments of the larger vessels with tubes of a chemically inert substance has achieved a cure. But surgical techniques have not yet been perfected to treat the smaller but equally vital vessels that supply blood to the brain and the heart. Also, surgery has obvious limitations when atherosclerosis is extensive.

But research on diseases of the aged is progressing, and reports of such gain are expected from the Medical Research Committee of the White House Conference on Aging.

Recent clinical dental research has shown that loss of teeth after age 35 is due most commonly to periodontal disease, the result of inflammation or degenerative processes of the supporting tissues of the teeth, rather than diseases of the teeth themselves. Consequently dental researchers have turned to oral hygiene and its relationship to systemic disease. Clinical dentistry currently concerns itself with controlling or managing periodontal disease, rather than curing it. The need for workers in dental research is critical.

Research in dermatology is emphasizing the correlation of physical insults, such as excessive exposure to sunlight, weather, and radiation,

with changes in the skin. Most skin cancer in older people develops slowly from benign lesions. As there is considerable difficulty in evaluating potential malignancy, research leading to better prognostication is needed. Pruritis, a common disorder of the aged, while not jeopardizing life, is distressing. Adequate therapy for senile pruritis is lacking.

Optimal nutrition for the aged, although based on the same requirements as those of the mature adult, is not consistently realized. Partly responsible are changes in body processes, such as decreased secretion of digestive juices, reduced motility of the gastrointestinal tract, and impaired biliary function, which limits tolerance of fatty foods and may result in an insufficiency of fat soluble vitamins. Inadequate nutrition is also associated with reductions in the general metabolic rate, restricted physical activity, and impairment of the senses of taste and smell. Most nutritional research has been done with laboratory animals and relates diet to general health. Closely controlled longitudinal studies with human subjects are required to evaluate the effect of diet on the process of aging.

Cataracts, macular degeneration, and glaucoma are eye diseases most common among older persons. Untreated, these can cause blindness or serious impairment of vision. Surgery is effective in removing cataracts, and glaucoma can be treated by chemotherapy, but there is no adequate treatment of macular degeneration. Almost nothing is known of the causes of these three diseases, and a great deal of basic research in their pathogenesis is needed.

The organic brain syndromes, associated with tissue changes in the brain or the blood vessels supplying the brain, are the conditions encountered most frequently in geriatric psychiatry. The causes of the changes are unknown. Current therapy, aimed at amelioration of symptoms, has not been markedly successful. Prevention awaits clarification of the causes.

The high incidence among the aged of psychoneurotic reactions, especially depression, has recently received increased attention. Predisposing personality patterns, stresses such as loss of self-esteem, being thrust into a role of decreasing value to others, and increasing

social isolation have been indicted as causative. Effective treatment calls for exacting analysis of the interrelationships of these factors.

## Restoration of Vision

**brief** From an aged person's point of view, the last 6 months of life may be the most precious. And as disabilities and disease confine his movements, his sight becomes more important than ever. At the Home for Aged and Infirm Hebrews in New York City, we endeavor to maintain the vision of our residents at the highest possible level.

Almost every resident needs eyeglasses. Prescribing them, however, sometimes requires patience, persistence, and the use of nonsubjective techniques. For example, one patient, viewing a chart through two different lenses, when asked which one was better, replied, "Neither." Such questions and answers may continue for 10 minutes, because it is sometimes difficult to penetrate an aged person's consciousness. But unless a satisfactory examination is made, a possible 20/40 vision may be adjusted only to 20/70.

Surgery is necessary to preserve the vision of some residents. Failure to use surgery for the aged is often excused by vague statements about the patient's age, the fact that he hasn't much longer to live, and that he shouldn't be bothered with the pain and suffering of an operation. This thinking is often based on an erroneous concept of the ability of the aged to withstand surgical trauma with reasonable safety. This ability is demonstrated, I believe, by our experience with ocular surgery for residents of the home.

I have reviewed 118 major eye operations performed over a 15-year period on a series of patients aged 65 to 94 years. Seventy patients were in the age group 75-84 years; 28 were in the age group 65-74 years, and 20 were in the age group 85-94 years. Most of the operations were for cataract extraction (85) or for glaucoma after medication had failed (18). The remainder were for a variety of conditions.

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*Based on a paper by Morris Feldstein, M.D., department of ophthalmology, Home for Aged and Infirm Hebrews, New York City.*

The most frequent contraindication for surgery was a psychotic state in which the patient was unmanageable or likely to be unaware of his visual status. However, this condition is open to question. In the past, when both eyes were covered following a cataract operation, the patient frequently developed a postoperative psychosis with disorientation and loss of contact with reality. When the unoperated eye was uncovered, the psychosis disappeared. It is possible that the psychosis of a blind, psychotic person may have been induced by the onset of blindness, and restoration of vision may improve his mental state.

Another contraindication was the patient's lack of desire for surgery. However, if glaucoma or a hypermature cataract was likely to cause irreversible damage, we have strongly urged the patient to undergo surgery. Usually he follows this advice. The interplay of vision and mental health must be considered critically. An old man's apparent satisfaction with failing vision may actually stem from a depressed state brought on by subconscious fears of impending blindness. He may really need forceful encouragement to undergo an operation.

When surgery was needed, we considered many serious medical conditions as deterrents rather than absolute contraindications. These included hypertension (62 patients), arteriosclerotic heart disease (30 patients), general or peripheral arteriosclerosis (30 patients), pulmonary emphysema (16 patients), and diabetes mellitus (11 patients). Each case was discussed and evaluated individually by the medical staff, and because each operation was a calculated risk, the patient's demand for vision was often the deciding factor.

One 83-year-old's experience is enlightening. He had bilateral cataracts, but the medical staff was reluctant to permit surgery because he suffered from left-sided heart failure, pulmonary emphysema, hypertension, epidermoid carcinoma of the vocal cord, chronic cholecystitis, and severe orthopnea. When he threatened to commit suicide if nothing was done to restore his vision, the medical staff reluctantly agreed to ocular surgery. His medical condition showed no deterioration as a result of the operation, and 4 weeks later he was fitted with glasses giving him 15/30 vision in the right eye. Al-

though he lived only 8 months longer, those months were brightened by his ability to see.

There were limited goals for the operations, particularly those for cataract or glaucoma. As a result of the cataract operations, 84 percent of the eyes showed vision of 15/70 or better, sufficient sight to enable the patients to take care of themselves. Most of them had a return of useful central and peripheral vision, although central vision was defective in some instances by reason of their particular eye lesions. The patients with glaucoma were not numerous enough to draw any conclusions regarding surgical techniques or visual results.

Both general and ocular postoperative complications were studied. One hundred and eight patients had no general complications. Six had acute postoperative psychoses. One suffered pulmonary infarction and another had a myocardial infarction and recovered. Two patients died, one with congestive heart failure after 14 days and another with acute myocardial infarction on the second postoperative day.

Twelve patients had ocular postoperative complications, but 10 of these eventually recovered. Two lost vision of the eye completely, one because of infection and the other because of corneal degeneration.

The small number of postoperative complications supports the opinion that many aged persons can undergo ocular surgery. Despite the risks, older persons stand to gain much by the restoration of their vision.

## Environmental Stresses

**brief** We have no definite information as to how and to what degree people of various ages respond to stresses of heat and cold. However, there are some suggestive bits of information as to whether environments per se cause the stresses in older persons that we anticipated in the past.

The traditional concept that older people are less tolerant of heat appears to be borne out by one piece of experimental evidence. There

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*Based on a paper by Steven M. Horvath, Ph.D., head, department of physiology, Lankenau Hospital, Philadelphia.*



## Safety Hints for the Elderly

Household aids and personal practices which help to prevent accidents are described in a series of folders, "Safety Hints for Elderly Persons," published by the National Safety Council. Titles in the series are "Poor Eyesight?" "Tire Easily?" "A Little Shaky?" and "Forget Things?" Each 4-page folder is 3½ by 8 inches and illustrated in four colors.

Professional workers providing services for elderly persons can obtain single sample sets. For price information and sample set, write the National Safety Council, Home Department, 425 North Michigan Avenue, Chicago 11.

was a striking contrast in the responses of young and old persons exposed to a dry temperature of 100° F. and a wet bulb temperature of approximately 72° F., an environment not uncommon in the United States. Young people 18 to 24 years of age responded with perspiration in quantities sufficient to maintain body temperatures at normal levels. If they remained quiet, they suffered no ill effects, but if they stood erect for 5 minutes or more, approximately 40 to 50 percent had a syncopal response.

Those in the age group 60-80 years did not perspire as readily as the younger persons; their body temperature tended to rise more rapidly, and if they stood erect in the heat, their tendency for syncope was much greater. This suggests that tolerance of heat diminishes as a person's age increases. The intricacies of this phenomenon remain unelucidated and require considerable additional investigation.

More surprising was the difference in the responses of young and old to a temperature of 10° C., or approximately 48° F. In this experiment the subjects were nude. In 8 to 11 minutes, the 20- to 30-year-olds started shivering violently. They shivered at a rate and intensity equivalent to doing mild work, in the category of 700 kilometers per minute. In a cold environment this is a fairly significant stress.

The 65- to 85-year-olds failed to start shivering after 40 to 45 minutes. Only 1 older person in 10 responded with an increase in metabolism.

This relative lack of response was accompanied by little or no increase in the production of heat by the body, whereas the younger people responded with a threefold to fourfold increase in their metabolic heat production.

Whether the response of the older group indicates failure or better adjustment is an unanswered question. However, it raises a number of speculations as to the mechanisms by which the human organism is able to respond to different environmental stresses.

## Loss of Hearing

**brief** More older people suffer from defective hearing than from heart disease, paralysis, joint diseases, tuberculosis, or cancer. Everyone, if life is long enough, suffers from presbycusis, a progressive loss of hearing (peripheral, central, or cortical, and either continuing or intermittent) caused by failing functions in the neural apparatus of hearing.

However, presbycusis can begin at or even before the age of 30 years.

Many excessive stresses may precede the onset of presbycusis—recurrent and continuing strains from emotional episodes; drugs such as quinine and the salicylates; tobacco, coffee, tea; some alkaloids and antibiotics; overexertion; bacterial and viral infections; acoustic, psychic, and other traumas; electric shock; endocrine and metabolic disorders; pregnancy; vitamin deficiencies; hyperoxia and hypoxia; exposure to cold; allergies; thromboses and vasospasms. But unless a hearing loss is progressive and without apparent, immediate cause, it should not be called presbycusis.

It is difficult to determine when presbycusis begins, but when is it well established, the patient or his family may diagnose it.

Presbycusis must be primarily due to deficiencies in metabolism, in supply or proper disposal of waste, or both. Many years ago Prof. Ernest Glen Wever of Princeton, N.J., demonstrated experimentally how the hearing

*Based on a paper by Edmund Prince Fowler, M.D., chairman, central bureau of research, American Otological Society.*

of animals was affected by various degrees of anoxia. In my opinion, intravascular clumping or agglutination of the blood and its effect in lowering the supply of oxygen is one of the most important factors in the aging process, and notably, in the aging of the auditory apparatus.

The caliber of the smallest blood vessels, the capillaries, is just about the diameter of one red blood cell, so that even if two or three cells are clumped, they will have to be pushed through with more speed than normal to release sufficient oxygen. If two blood cells are stuck together, 50 percent of their surfaces will not be functioning. If 10 are stuck together, 90 percent of their surfaces will not function.

We do not know why blood cells do not always stick together. The cells, like all proteins, are sticky and certainly blood plasma is sticky. However, we do know that we can cause experimentally an intravascular clumping of the blood by slowing circulation sufficiently, especially in the arterioles and arteriolar capillary sphincters. We know that the blood cells have a higher specific gravity than the plasma and that the impedance of flow causes the cells to settle to the bottom of horizontal vessels and to stick together in masses.

Clumping or sludging of blood is universally present in varying degrees in the aging adult. Abnormal vascular functioning depends somewhat on inheritance, as influenced by environment, but especially on emotional reactions. In my opinion, this abnormal functioning is not usually precipitated by stress alone, but by excessive stress, which is strain.

There is no sure way to avoid presbycusis. Short of being able to choose our parents, the most important steps are to avoid exposures to excessive noise, violent explosions, traumas, infectious diseases, poisons, and to lessen the strain of severe emotional episodes.

The otologist now has drugs which, if used in time, can help to prevent certain types of otherwise permanent neural deafness, which even though moderate in the first decades of life, can set the stage for earlier onset of presbycusis than would otherwise be expected. Means of diminishing intravascular agglutinations of blood also exist; however, the more powerful drugs cannot be used indefinitely.

Because loss of hearing in older people is always partly due to neural lesions, they do not respond well to amplified sounds. This is because of the presence of recruitment of loudness and recruitment of frequency, which not only make loud sounds louder but distort their timbre, particularly of speech. However binaural hearing aids, if properly manufactured and adjusted to the individual patient, can rehabilitate these persons.

## *Podiatry for the Aged*

**brief** It would be safe to assume that the majority of our older citizens have sore feet; L. A. Frost, D.S.C., of Monroe, Mich., estimates that 85 percent have foot disorders.

The feet of the aged are susceptible to injury because of some degree of insensitivity to heat and cold, retarded healing of poorly nourished tissues, loss of the fat padding the soles, and the thinning of skin on the toes. Also, because most aged persons have chronic, progressive, or degenerative disorders, they are likely to have a predisposition to gangrene. Therefore any blister, bruise, abrasion, or cut should be a cause of concern.

Proper foot care is particularly important for persons with diabetes and vascular disease. At Cincinnati General Hospital, 15 podiatrists under Louis G. Hermann, M.D., care for the feet of patients with these diseases. When this service began 12 years ago 22 to 24 amputations per month were performed; now the number has decreased to between 2 and 4 per month.

Hospitals and nursing homes have found that prophylactic foot care for their patients contributes to the well-being of the whole person. Precisely made and fitted footgear and appliances and devices to redistribute weight stress often enable patients to move about readily and they are more easily motivated toward rehabilitation. Proper foot care can also lessen the possibility of additional podiatric, medical, or surgical care for the patient and reduce the amount of institutional care and expense.

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*Based on a paper by Edward L. Tarara, D.S.C., Mayo Clinic, Rochester, Minn.*

# Nursing Service in Homes for the Aged

FRANZ GOLDMANN, M.D.

**T**HE FUNCTIONS of homes for the aged have changed profoundly with the passage of time. In the old days provision of room, board, and some personal care was the major concern, and arrangements for medical and nursing services were incidental. In recent years, systematic provision of all personal health services required by the residents has come to play an increasingly important, often dominating, role. Acceptance of new responsibilities was a matter of necessity rather than choice for the homes. It was prompted by the marked increase in the number both of infirm elderly people seeking admission and of residents beyond 80 years who were physically or mentally declining during their long stay in the home.

This process of readjustment of functions is likely to continue and spread in the near future. As a result, more and more homes for the aged will become nursing homes in fact and be confronted with the complex problem of proper organization of personal health services. Good nursing service is of course essential to the humane, effective, and economical care of the people living in homes for the aged. What type of nursing personnel should be employed? How many employees are needed to serve a given number of residents? How many

professional nurses, practical nurses, and nurse aides should be on the staff of a home of a certain size? These are practical questions begging to be answered.

"To speculate without facts is to attempt to enter a house of which one has not the key," as Julian Huxley once remarked. What is necessary for sound action is examination and evaluation of the policies and experiences of large numbers of homes. Such an inquiry has been made in connection with a series of studies on coordination of health services for patients with long-term illnesses. The project is sponsored by the Council of Jewish Federations and Welfare Funds, New York City, and supported by a grant from the Division of Hospital and Medical Facilities, Public Health Service.

This report presents findings on nursing personnel in 70 Jewish homes for the aged in 51 cities of the United States and Canada and, from another study, data on the amount of nursing service actually given to 530 residents of five homes. Observations on other types of service have been published elsewhere (1).

## Nursing Personnel

Information on nursing personnel was collected from the 70 Jewish homes for the aged through detailed questionnaires. This material was supplemented by field studies of 11 of these homes.

Most of the 70 homes employ regular staffs composed of a great variety of persons with special skills, maintain special units for the ill and infirm, and have more or less definite arrangements with general hospitals for inpatient and outpatient care of those residents who cannot be treated in the home. Many possess diagnostic and therapeutic equipment of

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various types. Several homes have more or less definite arrangements with general hospitals for regular utilization of certain of their facilities, such as clinical and radiological laboratories, and for the services of members of their medical staffs at the homes.

In 1957, nursing personnel were regularly employed by all 70 homes, which contained a total of 11,148 beds. Professional nurses accounted for one-eighth of the total nursing personnel, practical nurses for one-third, and nurse aides and attendants for more than one-half (table 1).

The staffing pattern varied widely among homes of different sizes. Professional nurses were employed in 60 homes. They were lacking in the three homes with fewer than 25 beds but were available in 8 of the 13 homes in the 25- to 49-bed category, in all but 2 of the 36 homes with 50 to 199 beds, and in all the 18 larger institutions. The proportion of professional nurses in the 60 homes declined with increase in bed capacity; it ranged from a high of 21.7 percent in the small homes to lows of 8.7 and 7.8 percent in the largest homes.

Practical nurses, on the staffs of all 70 homes, constituted the great majority in the homes with fewer than 25 beds, but they were in the minority in the homes with 50 beds or more. Use of nurse aides and attendants was relatively uncommon in homes with fewer than 50 beds but increased in frequency in the larger homes.

In all homes with more than 100 beds more than one-half of the nursing personnel were nurse aides and attendants and less than one-third were practical nurses. Conversely, at the smallest homes practical nurses made up the majority and nurse aides the minority.

For quantitative measurement, the number of nursing personnel was related to the number of beds. This method was chosen because pertinent data were easily available, and the figures for beds could be presumed to differ little from those for days of care because of high average occupancy of the homes.

The total nursing personnel employed by the 70 homes in 1957 averaged 19.7 per 100 beds, a ratio of one nurse to five beds. This figure, however, conceals exceedingly wide variations. Five homes employed more than 30 nurses and aides per 100 beds, while eight homes had fewer than 10 per 100 beds (table 2). Both high and low rates were observed in each of the categories, but as a group the smaller homes compared unfavorably with the larger ones. Of the 33 homes with fewer than 100 beds, only 9 met or exceeded the average of one nurse to five beds, whereas 17 of the 37 homes with more than 100 beds did so.

The number of professional nurses employed by 60 homes averaged 2.4 per 100 beds. The rate was lowest (1.6) in the two homes in the 400- to 599-bed category, where professional nurses constituted 7.8 percent of the total nursing personnel.

**Table 1. Nursing personnel in Jewish homes for the aged, by specified size of homes, 1957**

Bed capacity <sup>1</sup>	Total number homes	Total number beds	Nursing personnel							
			All types		Professional nurses		Practical nurses		Aides and attendants	
			Number	Percent	Number	Percent	Number	Percent	Number	Percent
All homes.....	70	11, 148	2, 196	100. 0	261	11. 9	731	33. 3	1, 204	54. 8
Under 25.....	3	65	13	0. 6	0	0	9	69. 2	4	30. 8
25-49.....	13	517	83	3. 8	18	21. 7	43	51. 8	22	26. 5
50-99.....	17	1, 160	192	8. 7	31	16. 1	80	41. 7	81	42. 2
100-199.....	19	2, 793	515	23. 5	66	12. 8	153	30. 7	291	56. 5
200-399.....	14	3, 741	650	29. 6	83	12. 8	202	31. 1	365	56. 1
400-599.....	2	938	192	8. 7	15	7. 8	57	29. 7	120	62. 5
900 and over.....	2	1, 934	551	25. 1	48	8. 7	182	33. 0	321	58. 3

<sup>1</sup> No homes with 600 to 899 beds.

ing personnel. It was highest (3.5) in the 13 homes with 25 to 49 beds, where professional nurses made up 21.9 percent of the nursing staffs. A ratio of at least one professional nurse to 50 beds was achieved by 16 of the 33 homes with fewer than 100 beds and by 20 of the 37 larger homes (table 2).

Theoretically, the size of the nursing staff can be expected to depend largely on the extent of provisions for care of ill and infirm persons in special units such as infirmaries or hospital divisions. At the 70 homes studied, 4,555 beds, or 40.9 percent of the total, were specifically designated for service to chronically ill or substantially disabled residents. Most of these beds were in larger homes: nine-tenths in homes with 100 beds or more and almost seven-tenths in homes with 200 beds or more. Furthermore, the proportion of beds in special units of large homes greatly exceeded that in small homes (table 3).

Number of nursing personnel and proportion of beds in special units were found to be correlated, as expected. Nineteen of the thirty-five homes maintaining 30 percent or more of their total beds in units for ill persons had nursing personnel averaging 20 or more per 100 beds; 16 of these homes employed 3 or more professional nurses per 100 beds. In contrast, only 7 of the 35 homes with less than 30 percent of

**Table 3. Percentage of beds in units for ill persons, Jewish homes for the aged, by specified size of homes, 1957**

Bed capacity	Total number beds	Beds in special units	
		Num-ber	Per-cent
Under 50-----	582	70	12.0
50-99-----	1,160	330	28.4
100-199-----	2,793	1,007	36.1
200-399-----	3,741	1,492	39.0
400 or more-----	2,872	1,656	57.7

their beds in special units had such rates (table 4).

If nurse power rather than proportion of beds in special units is taken as the measure, an equally revealing picture emerges. Four of the five homes employing 30 or more nurses and aides per 100 beds assigned 20 percent or more of their total bed capacity to special units, 50 percent or more in two large institutions, 30 to 39.9 percent in a medium-sized home, and 20 to 29.9 percent in a small home. The eight homes with fewer than 10 nurses and aides per 100 beds included three without regularly assigned beds for the sick.

The median number of nursing personnel per

**Table 2. Nursing personnel rates in Jewish homes for the aged, by specified size of homes, 1957**

Number nursing personnel per 100 beds	Total number homes	Number homes with specified bed capacity				
		Under 50	50-99	100-199	200-399	400 and over
All homes-----	70	16	17	19	14	4
<i>All nursing personnel</i>						
Under 10-----	8	1	2	3	2	0
10.0-14.9-----	17	5	3	5	4	0
15.0-19.9-----	19	5	8	2	3	1
20.0-24.9-----	13	2	2	5	3	1
25.0-29.9-----	8	2	2	2	1	1
30 and over-----	5	1	0	2	1	1
<i>Professional nurses</i>						
None-----	10	8	1	1	0	0
Under 1-----	7	1	0	3	3	0
1.0-1.9-----	17	0	7	4	3	3
2.0-2.9-----	13	3	2	4	4	0
3.0-3.9-----	12	0	5	4	2	1
4.0-4.9-----	9	3	1	3	2	0
5 and over-----	2	1	1	0	0	0

100 beds for each of the categories of homes is shown in the chart. For all nursing personnel, the medians for homes with 400 or more beds and those with 100 to 199 beds, which together provide one-half of the total beds, meet or exceed the ratio of one to five beds. The medians for professional nurses in the categories 50-99, 100-199, and 200-399 beds amply match the ratio of one nurse to 50 beds. Practical nurses and nurse aides play a dominant role in all homes but especially in the smallest and largest.

### Nursing Service

Intensive case studies conducted at five Jewish homes for the aged in Chicago, Miami, Philadelphia, St. Louis, and Toronto yielded detailed information on all personal health services received by 530 residents at certain periods of 1958. The study teams consisted of physicians, nurses, social workers, and administrators on the staffs of the homes. The following summarizes the findings on nursing service, based on detailed reports of the directors or supervisors of nursing, all experienced professional nurses.

To see the situation in proper perspective, two general observations must be kept in mind.

**Table 5. Nursing service received by patients in units for ill persons in four Jewish homes for the aged, 1958**

Daily hours of nursing service	Persons receiving specified hours of nursing service	
	Number	Percent
All homes.....	206	100.0
Less than 1.....	71	34.5
1 to 2.....	57	27.7
2 to 3.....	14	6.8
3 to 4.....	42	20.3
4 or more.....	22	10.7

First, almost all residents were in ill health, suffering from multiple chronic ailments, and many were substantially disabled. Mental impairment with symptoms of temporary or continuous confusion was the most common affliction, and marked emotional disorders were widespread. Second, 45 percent of all the persons in the study group were in a unit for ill persons, such as an infirmary or a hospital division, and of these patients seven-tenths were mentally confused and one-fifth incontinent (2,3).

At the time of the study, 9 in every 10

**Table 4. Nursing personnel rates in relation to percentage of beds in units for ill persons, Jewish homes for the aged, 1957**

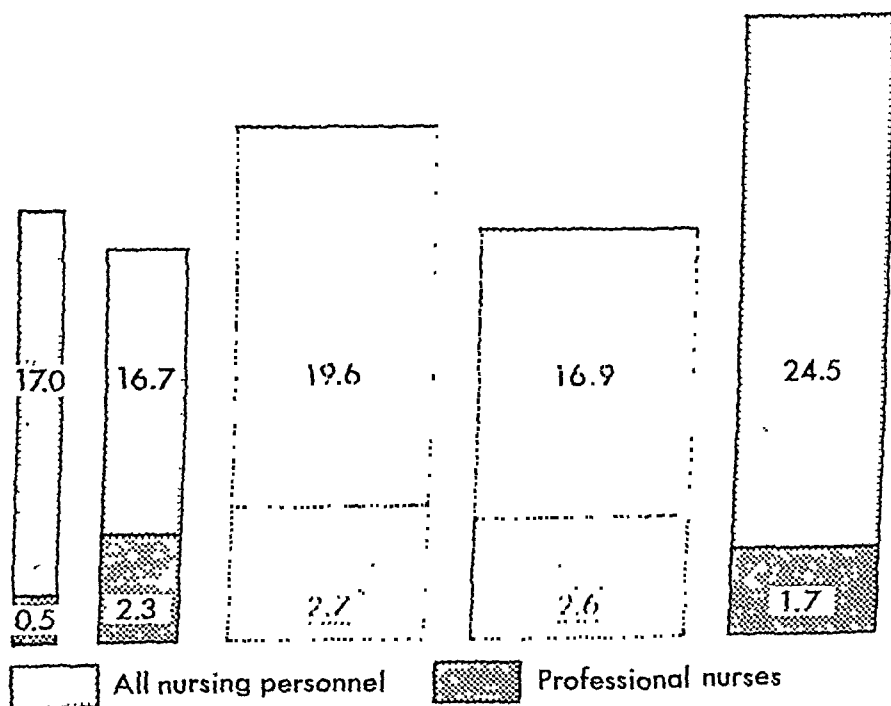
Number of nursing personnel per 100 beds	Total number homes	Number homes with specified percentage of beds in units for ill persons					
		None	Under 20	20.0-29.9	30.0-39.9	40.0-49.9	50 and over
All homes.....	70	11	7	17	10	10	15
<i>All nursing personnel</i>							
Under 10.....	8	3	2	1	1	1	0
10.0-14.9.....	17	4	2	8	1	0	2
15.0-19.9.....	19	3	2	3	4	4	3
20.0-24.9.....	13	0	0	3	2	3	5
25.0-29.9.....	8	1	0	1	1	2	3
30 and over.....	5	0	1	1	1	0	2
<i>Professional nurses</i>							
None.....	10	5	1	3	1	0	0
Under 1.....	7	1	1	2	1	0	2
1.0-1.9.....	17	1	2	5	2	2	5
2.0-2.9.....	13	0	2	5	1	3	2
3.0-3.9.....	12	1	0	1	2	4	4
4.0-4.9.....	9	2	1	1	2	1	2
5 and over.....	2	1	0	0	1	0	0

persons in the residential units of the homes were receiving nursing service, the great majority less than 1 hour a day, every eighth person from 1 to 2 hours, and a few a larger amount. Three homes provided such service for every resident, one for more than 8 in 10, and one for more than 5 in 10. The proportional distribution of hours of nursing differed from home to home. At one extreme, one home reported less than 1 hour of nursing for each resident receiving such care, who constituted about one-half of the persons in the residential unit. At the other extreme, two homes, which gave nursing service to every person in the residential unit, reported less than 1 hour for three-fourths of the residents and more for the remainder.

In examining the situation in the infirmaries or similar units for ill persons, the home in Toronto had to be excluded because of its unusual organization. In the other special divisions the average amount of nursing service ranged from less than 1 hour a day for every third patient to 4 hours or more for every ninth. More than one out of four patients was receiving 1 to 2 hours of such service, and almost the same proportion, between 2 and 4 hours. Those requiring 2 hours or more of nursing service a day constituted close to four-tenths of all infirmary patients studied, and those requiring 3 hours or more made up almost one-third (table 5). There were substantial variations among the homes with regard to the proportional distribution of nursing time. One home

Median number of nursing personnel per 100 beds in homes of specified size, Jewish homes for the aged, 1957

Bed complement	under 50	50-99	100-199	200-399	400 and over
Total beds	582	1,160	2,793	3,741	2,872



Median number of nursing personnel per 100 beds

furnished less than 1 hour of nursing service to every other person in the infirmary and 4 hours or more to only a few patients. At the other extreme, one home reported less than 1 hour of nursing for very few persons but 4 hours or more for four-tenths of the patients in the infirmary.

## Discussion

The policy followed by the homes for the aged in building up their nursing staffs reflects recognition of three facts: (a) almost every resident needs some nursing care at some time; (b) numerous residents require continued nursing service in substantial amount over long periods of time; and (c) much of the service can be given by practical nurses and nurse aides under the direction and supervision of professional nurses. As the findings from the two studies show, the size of special units for the sick and the type of patients in these units strongly influence the quantity of nursing personnel in the homes.

The average ratio of one nurse or nurse aide to every five beds in the 70 homes is encouraging. If nothing else, it proves at least the possibility of attracting nursing personnel to places shunned in the past. Taken in conjunction with findings on other types of health personnel active in the homes, the development of nursing staffs can be regarded as part of a movement toward a constructive approach in place of passive acceptance of the ailments of old age.

Impressive as the picture of the average situation in all 70 homes is, it is marred by the differences between individual homes. Of course, some disparity must be expected and is justified. But the variations in the supply of nurse power are too wide to be ignored. For instance, the number of nursing personnel per 100 beds ranged from 7.7 to 30.4 in the 17 homes assigning between 20 to 30 percent of their beds for the care of the sick and infirm and from 13.4 to 31.6 in the 15 homes using one-half or more of all beds for this purpose. Such differences can be explained but hardly excused.

Constant supervision of the numerous mentally confused residents and systematic care of the many incontinent are responsibilities taxing

the strength and temper of the personnel. Yet, these are only some of the countless duties to be carried out for those patients in the special units who need regular attention for many months, if not several years. Moreover, administration of medications, such as tranquilizers, care of the skin to prevent bedsores, and help in eating, bathing, and general personal care are functions to be performed for the majority of the elderly people in the residential units as well as for all those in the units for ill persons. Above all, the "therapy of friendship" for the numerous elderly people with marked emotional disorders requires patience, prudence, and perseverance—and the time for it.

Employment of professional nurses as well as other personnel with different degrees of skill is the rule in 60 of the 70 homes. The general tendency is to employ relatively few professional nurses and to rely heavily on practical nurses and nurse aides and attendants. Unquestionably, division of responsibility according to functions is a widely accepted principle. In most instances, the professional nurses direct, supervise, and coordinate the nursing activities and limit direct service to therapeutic procedures requiring high skill or involving great responsibility. In some instances they give regular bedside care as well. According to my observations in a number of homes, this policy has worked satisfactorily, although it has not led to the disappearance of the harassed professional nurse. Yet, fundamental problems warrant mention.

Satisfactory delineation of the functions to be performed by professional nurses, practical nurses, and nurse aides is not easy. Division of responsibility is of little avail unless accompanied by unification of effort. To meet the nursing needs of individuals fully, proper service must be available when and as long as required. Of paramount importance is individualizing service according to the resident's physical ability, mental capacity, temperament, and, in particular, the degree of ability to follow the daily routine of the average healthy person. This implies not only agreement on the functions to be performed by the various types of nursing personnel but also development of methods of direction and supervision that will stimulate



recognition and foster acceptance of interdependence without stifling independence.

It is simple to state that nursing care should be provided at the least cost compatible with quantitative and qualitative adequacy. Unfortunately, there are no standards derived from practices of proved value that can be used to appraise the adequacy of the nursing personnel in individual homes. What is a satisfactory ratio of total nursing personnel to beds? Proportionately how many professional nurses are required for attainment both of humane and effective care of the residents and of efficient operation of the home? These are still wide open questions. In the search for solutions some help may be gained from the patterns found by this study in homes of various sizes, as shown in the chart. The homes with the largest nursing staffs employ one nurse for about four beds and those with the next largest staffs have one nurse for every five beds. This policy is all the more significant as it is followed by homes containing 50.8 percent of all beds in the 70 homes. The observation that one professional nurse for approximately 50 beds is available in all but the smallest homes may also be meaningful.

The tables on nursing personnel intentionally relate data on personnel to beds in the homes. Is this the most dependable method of measurement? In studying this question it was found that in 1957 two homes, containing a tiny proportion of all beds, were occupied in excess of their official bed complements and that 24 homes, containing one-fourth of all beds, for a variety of reasons had less than 90 percent

occupancy, the average being 76 percent. In view of this observation all data on nursing personnel were also related to the total number of days of care actually provided during the year (table 6). On the basis of this calculation more homes could be classified as relatively well supplied with nursing personnel, and more homes move up into the top bracket. If confirmed by other studies, this finding would mean that the method of using beds as the unit of measurement is good for general purposes, but the method of using days of care is preferable for determination of the relative position of categories of homes.

It would be valuable to compare the provisions for nursing personnel at the 70 Jewish homes for the aged with those in Protestant, Catholic, and nonsectarian homes for old folks. For the time being, this is impossible owing to lack of large-scale studies of these homes. All that can be done at present is to examine the situation at other types of homes serving mainly elderly persons with chronic illness or serious impairment of physical or mental function.

In connection with the inquiries into the problem of coordinating health services for patients with prolonged illness, detailed data on nursing personnel were obtained in 1957 from six Jewish institutions classified as homes for the chronically ill and disabled and from eight Jewish facilities classified as chronic disease hospitals. Comparison of nurse power in these facilities with that in homes for the aged reveals similarities as well as differences (table 6).

**Table 6. Comparative rates of nursing personnel in three types of institutions for long-term care, 1957**

Type of institution	Total number institutions	Average rates of nursing personnel					
		All types		Professional		Practical and aides	
		Rate per 100 beds	Rate per 100 days of care	Rate per 100 beds	Rate per 100 days of care	Rate per 100 beds	Rate per 100 days of care
Homes for the aged.....	70	19.7	21.4	12.4	12.6	17.4	18.9
Homes for chronically ill.....	6	40.0	42.2	4.5	4.7	35.5	37.5
Chronic disease hospitals.....	8	44.2	53.0	10.1	12.1	34.1	40.9

<sup>1</sup> Refers to 60 homes employing professional nurses.

In the six homes for the chronically ill and disabled, professional nurses accounted for 11.2 percent, practical nurses for 30.9 percent, and nurse aides and attendants for 57.9 percent. Thus the proportional distribution of the various types of nursing personnel was about the same as in the homes for the aged. However, there were significant differences in the amount of nurse power. The rates for both total nursing personnel and for professional nurses in homes for the chronically ill and disabled were twice those in homes for the aged.

To interpret this finding several facts must be kept in mind. The age composition of the populations of the two types of institutions is quite similar. Almost all the residents remain in the homes to the end of their days. Practically all the people in homes for the chronically ill and disabled require much, and often continuous, nursing service because of the severity of their impairments, but more than one-half of those staying in the homes for the aged are able to live in residential units and, except for a few, need only some nursing service from time to time. Thus the findings on nurse power in the two types of institutions seem to correspond remarkably well.

Quite different is the situation in the eight chronic disease hospitals. There professional nurses made up 22.8 percent of the staff, practical nurses accounted for 15.3 percent, and nurse aides and attendants for 61.9 percent. Thus the proportion of professional nurses was double that in the two other types of facilities, and the proportion of nurse aides and attendants was somewhat higher. The rate for total nursing personnel in the chronic disease hospitals was slightly above that in the homes for the chronically ill and disabled and more than twice that in the homes for the aged.

In contrast to the homes for the aged and the homes for the chronically ill, the chronic disease hospitals studied are designed for active treatment of patients with seriously disabling long-term illness. They discharge a substantial number of patients after a few months of intensive treatment and, accordingly, use their beds for an average of more than one patient during a year. Because of their particular functions, the chronic disease hospitals need a relatively large nursing staff and

must place greater emphasis on use of professional nurses. As a study of 527 patients in four chronic disease hospitals in four cities revealed, one-half of the patients actually received from 2 to 4 hours of nursing service a day during their first week in the hospital and one-fifth required 4 hours or more.

Like the homes for the aged studied, proprietary nursing homes serve a group of people characterized by an average age of 80 years and high prevalence of mental confusion and incontinence. Yet their provisions for skilled nursing personnel compare unfavorably with those of the homes for the aged, if the test is applied to the two types in their entirety rather than to individual homes. One out of three proprietary homes in 13 States studied during 1953-54 by the Public Health Service and the Commission on Chronic Illness had neither a professional nor a licensed practical nurse on the staff. Professional nurses were available in only two out of five homes and practical nurses were the persons with highest skill in one out of four homes (4). The great majority of these homes, however, had fewer than 25 beds in contrast to only 3 of the 70 Jewish homes for the aged.

A study made in the State of Washington in 1956 gives insight into the staffing pattern of 300 licensed nursing homes and homes for the aged, with a total of 9,122 beds. Professional nurses accounted for one-fifth, practical nurses for close to one-fifth, and nurse aides for more than three-fifths of the total nursing personnel. Compared with the 70 Jewish homes for the aged and the 6 Jewish homes for the chronically ill, the facilities in Washington had larger proportions of both professional nurses and nurse aides and a much smaller proportion of practical nurses (5).

### Summary

The organization of nursing service was studied in 1957 at 70 Jewish homes for the aged, and the amount of nursing service actually given was determined in 1958 for 530 residents of five Jewish homes for the aged.

Professional nurses made up one-eighth of the total nursing personnel in the 70 homes, practical nurses one-third, and nurse aides and

attendants more than one-half. Professional nurses were employed by 60 of the 70 homes. The proportions of both professional nurses and practical nurses declined and that of nurse aides and attendants grew larger with increase in the size of the homes.

The ratio of all nursing personnel to beds in the 70 homes averaged 1:5 and that of professional nurses to beds in the 60 homes averaged 1:40. Both ratios varied markedly among homes of different size. They were relatively high in the majority of homes with more than 100 beds and in the minority of all smaller homes. Best supplied were the homes with 400 beds or more and the homes in the 100- to 199-bed category, which together contained one-half of all available beds. Homes with 100 to 399 beds, which provided almost three-fifths of all beds, led in employment of professional nurses.

The size of the total nursing staff was closely related to the proportion of beds in units for the care of ill and infirm residents.

At the five homes where case studies were made, 9 out of every 10 persons in the residential units were actually receiving nursing service, mostly less than 1 hour a day. In the units

for ill persons more than one out of every four persons was receiving 1 to 2 hours of nursing service and an equally large proportion from 2 to 4 hours. Almost 4 out of every 10 infirm patients studied required 2 hours or more of nursing service a day.

The policies and experiences of the homes with the largest nursing staffs may be useful in developing standards for both total nursing personnel and professional nurses in those homes for the aged which perform the functions of highly developed nursing homes.

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## Health, Education, and Welfare Indicators

A new monthly periodical, *Health, Education, and Welfare Indicators*, is being published by the Department of Health, Education, and Welfare. A handy reference on current developments in the field of human resources, it features up-to-date statistical information on consumer interests, health conditions, population trends, social security, births, deaths, and marriages. Month-to-month changes in a wide range of subjects are reflected in a series of charts and tables.

This publication is intended to supplement the annual "Health, Education, and Welfare Trends," published earlier this year and available at 50 cents a copy.

Copies of *Indicators* may be purchased from the Superintendent of Documents, U.S. Government Printing Office, Washington 25, D.C., at 35 cents each or \$3.50 per year (\$4.50 per year if mailed to a foreign address).

# Health Services at Home

Health services in the home are frequently prescribed for older people as a method of alleviating the strain on over-taxed medical and institutional facilities. For social, economic, and psychological reasons, this form of care is particularly recommended for some patients.

Participants in a symposium held at the National Health Forum in Miami Beach, Fla., March 16, 1960, thoughtfully examined the home care programs, their justification, organization, and future. Following are six papers based on the statements of the symposium participants.

## *The Nature of Health Services*

DAVID LITTAUER, M.D.

Current trends in growth of population are compelling us to review and modify the types of organization for health services presently available.

In 1940 there were 9 million people over age 65; in 1960 there are about 16 million, and projections for 1980 indicate that the number of persons over age 65 will climb to more than 24.5 million (1). In this age group are the greatest number of patients with long-term illness.

The proportion of those over 65 in the total population is also expected to increase from 8.76 percent in 1960 to 9.51 percent in 1980. If predictions of breakthroughs in the causes and treatment of such major illnesses as cancer and heart disease materialize, these estimates of numbers and percentages will probably prove to be conservative.

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The reasons for this increase in the over 65 age group have been well documented. They may be found in advances in preventive and therapeutic medicine and surgical techniques, in progress in nutrition, and in explosive trends in fertility.

Greater life expectancy is itself sufficient to increase the incidence of the long-term metabolic and degenerative illnesses among the aging and aged. However, other factors, not part of the biological aging process, also contribute to the incidence of chronic illness. The transition from a rural and agricultural economy to an urban and industrial one has meant economic and social dislocations of the aged, such as reduced employment opportunities, forced retirement from work at specific ages, and increasingly difficult three-generation living (2).

The increasing incidence of long-term illness resulting from this combination of scientific, social, and economic factors in modern society is already straining the resources of medical and institutional care presently at our command.

The solution cannot be found merely in

progressive expansion of beds and ancillary facilities in hospitals, nursing homes, and other institutions for inpatient care. The costs of new hospital construction are high; maintenance of hospital facilities is expensive and rising at the rate of 5 to 7 percent or more each year (3-5); and institutional facilities usually are least available in areas, such as rural counties, where geriatric populations are large and per capita income is low. Furthermore, institutionalization for long periods results in losses in personal satisfaction, initiative, and creativity. We must look for alternate solutions.

One of these is home care, the systematic provision of medical, nursing, social, and related services to patients in their homes. Home care is not a substitute for hospital services but an intrinsic component of a spectrum of progressive patient care which comprises acute in-hospital care (with intensive, intermediate, and self-care nursing elements), long-term in-hospital care, outpatient or office care, care in nursing homes and homes for the aged, and care in the home.

Of course, care in the home need not be confined to the aged who are afflicted with metabolic and degenerative illnesses of long duration. Individuals of any age may be treated successfully in their homes. Organized home care services have accepted and have had excellent results in treating patients with acute episodic illnesses, such as bronchopneumonia, or with acute manifestations of long-term illnesses, such as pulmonary tuberculosis or acute rheumatic fever (6,7). To date, however, organized home care has been used most to meet the health, social, and economic needs of the aged who are chronically ill.

Home care service may range from the ministrations of nurses in the home, supported by some medical supervision and limited auxiliary services, to a complex of organized services concerned with the total medical, nursing, restorative, and socioeconomic needs of the patient. These more elaborate types of services, organized in a formal administrative structure and sponsored by a hospital, a community agency, or a public health department, offer social casework, physical therapy, occupational therapy, housekeeper and homemaker services, and

laboratory and other diagnostic facilities of the hospital, in addition to physician care and visiting nurse service.

Regardless of sponsorship, the programs tend to exhibit certain common elements: a central administrative control responsible for the program and the policies under which it operates; an evaluation team responsible for coordination of services and for screening, review, and discharge of patients; a service team of physicians, nurses, social workers, and others responsible for immediate care of the patient in the setting of his home and family; and supporting in-hospital facilities for patients who need hospitalization. These programs place considerable emphasis on the need for staff conferences, records, reports, and other controls.

Such a structured organization has been found desirable in most of the 40-odd organized programs that have been established since E. M. Bluestone initiated a home care service at Montefiore Hospital, New York City, in 1947 (8,9). These programs have served principally welfare and medically indigent patients. All essential participants, including the physician, have been on stipends or have been reimbursed on a per visit basis by the central directing authority. As more experience is gained, and particularly as the base of home care is broadened to include the private patient of the practicing physician, it may be expected that modifications of the rigid pattern of organization will occur.

Although the value of home care is recognized by leaders in health, medical, and hospital fields as a community resource, it has not yet made much impact on the representatives of these professions in the field or on the public. In the 13 years since the Montefiore Hospital project was established, fewer than 50 organized programs have been founded, and 16 of these are under the auspices of one central agency, the Department of Hospitals in New York City. The national caseload has been variously estimated to average 2,000 to 5,000 patients.

The reasons for snail-like development of a health resource that has general approbation are various (10). Obstacles to growth include inadequate financing; inertia and even distrust on the part of physicians, hospital administrators, and other professionals; inadequate infor-

mation about costs and other operating data; deficiencies in community organization for health services; inability of many homes to accommodate the patient; and the public's lack of knowledge about home care as a resource. Time, money, research, and leadership of a high degree will be required to overcome these obstacles. Some may never really be solved. For example, how effectively can home care be given to the one older person in five who lives alone, or to the two older people in five who live alone or with persons who are not their children.

Nevertheless, there is evidence that some obstacles are beginning to be surmounted. It is found in such developments as the educational and organizational activities of national professional organizations and local community groups and in the extension of Blue Cross coverage in some localities, such as New York City and Detroit, to include care in their own homes of subscribers discharged from the hospital.

The potentials of home care as a community health resource are so vast that it is incumbent on us to explore every avenue of advance.

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## Official and Voluntary Agencies

CLAIRE F. RYDER, M.D.

Health services in the home are being furthered by official and voluntary agencies at the National, State, and local levels. At the national level, the American Medical Association, American Hospital Association, Blue Cross, Blue Shield, and the Public Health Service have been developing activities in home care.

One of the first tasks of these five groups was to define the term organized home care. At an invitational working conference held in Chicago in April 1960, representatives of these groups, national voluntary agencies, and operators of home care programs agreed on a working definition: A coordinated home care program is one that is centrally administered and provides for coordinated medical, nursing, social, and related services to selected patients at home, on the basis of integrated evaluation and planning.

The definition was the first step in determining the number of existing home care programs, which are currently being inventoried by the five groups. The inventory, an expansion of the one conducted by the American Medical Association in 1956, includes a history of each individual program, description of its services and administrative structure, and the number and types of personnel employed. Because knowledge of the number and kinds of patients receiving home care, length of stay, types of services they receive, and the actual costs of home care is inadequate, a vital part of the continuing inventory in the future will be an annual statistical evaluation of the program in terms of these factors.

From the findings of the inventory and the conclusions of the invitational conference the five groups plan to develop guide materials to

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assist communities that are either contemplating or conducting home care programs.

The Public Health Service, in addition to collecting and disseminating information on home care, has stimulated and supported pilot projects as another source of information for guidance materials. The Service has aided, through Federal formula grants to States, categorical and overall chronic disease programs. Some States in turn have distributed this money to local communities to start home care programs. As in other health activities, the Service, within its traditional relationships with State health departments, has provided consultation, orientation, and training of professional personnel.

On the State level, health departments have assumed several roles. The Kentucky State Department of Health is supporting rural home care services. The North Carolina State Board of Health is partially supporting a demonstration project in Person County, and Ohio and Connecticut are supporting the organization of local home care programs. Other State health departments are training personnel; one example is the New Jersey homemaker service described by Dr. Marian R. Stanford.

Training at the State level has been developed around new concepts in the care of the chronically ill which hinge on the prevention of disability. This has meant orientation to the need for early and intensive medical care for patients with such conditions as strokes, whether they are at home, in hospitals, or in nursing homes.

Localities have many kinds of programs for care at home, ranging from visiting nurse services alone, to multiple home care services, to the formally organized home care program. Local health departments and voluntary health agencies may operate a program, purchase services, or function as consultant or coordinator. Some health departments operate programs that provide physical therapy, occupational therapy, nutrition, and social services as well as nursing services.

In Hartford, Conn., the health department provides the personnel for the home care team. The Person County, N.C., home care program, in its second year as a demonstration, is an example of an organized program in a rural

area administered by the health department. Home care services are also being provided in Kentucky and Florida under local health department auspices.

Local health agencies have encouraged and supported these programs by supplying services to another agency that is administering the program. Often, although a hospital administers the program, nutrition services and physical and occupational therapy are purchased from the visiting nurse association or the health department.

Local voluntary agencies have supplied loan closets and materials and equipment for the patients in a home care program. They have also paid for services given to patients with a specific disease such as cancer, tuberculosis, or heart disease.

The local health department's traditional function of identifying facilities and resources in relation to the community's needs also applies to home care. In planning for the chronically ill, home care is frequently considered a top priority need. Of course, the local health department also acts as a catalyst to see that existing programs and services are utilized to the fullest and in a coordinated fashion, expanding them as the need arises or developing new services.

Because I feel that this is a vital and important role, I would like to describe an example of this type of community activity in Guilford County, N.C. In this community a study of the chronically ill by a consultant from the University of North Carolina School of Public Health showed a need for home care for a large proportion of patients. There were also detailed data on individual patient needs and an evaluation of the rehabilitation potential of the individuals, suitability of their homes, and their unmet needs for physical and occupational therapy, dentistry, and other items.

The study is a baseline from which this community is working. A committee consisting of representatives of all interested voluntary and official health agencies has been established. Its task is to develop services and programs for the chronically ill, and the first priority on its schedule is the organization of a home care program.

# Organization of the Family

ALBERT F. WESSEN, Ph.D.

For some years there has been emphasis on the family as the essential unit in planning for health services. Thus, epidemiologists talk of the family group as the focus for understanding the patterns of disease distribution in the community, and increasingly we hear of the importance of the family physician within the framework of good medical care. Since the home usually denotes the environmental setting for family living, the development of home care programs in recent years could be considered as a part of the same general trend.

There have been both positive and negative reasons for considering the family as an essential element in the pattern of the health services. Attention to the family comes as a reaction to the abuses of indiscriminate institutionalization and of the fragmentation inherent in specialized attention to purely individual problems. The family has also come to play an important part in medical thinking both because it tends to be the primary group, the common denominator of environmental influences within which "what affects one affects all," and because psychologists and psychiatrists have recognized the tremendous importance of family living in determining the motivations and emotional balance of individuals.

Human organizations can be thought of as cooperative arrangements of a group of persons seeking to accomplish some purpose. Members are arranged in some kind of working order, and each is expected to play his role in the accomplishment of the group's objectives. The structures of organizations may vary greatly. At one extreme there is the overwhelming complexity of a modern government; while at the other is the simple differentiation of typical American family members into the roles of father, mother, son, daughter, brother, and sister.

The effectiveness of an organization is a function of a number of factors. Some of the most important are (a) the members' commitment to common goals, (b) their knowledge about means for achieving these goals, (c) adequate resources for goal achievement, and (d) degree of coordination. In different situations, satisfaction of these prerequisites of organizational effectiveness requires the development of specialized social structures. It is the purpose of this paper to examine how the American family can, with some help, become an effective organization for the care of long-term illness.

## The Family and the Health Services

The family as an organization impinges upon the health services in at least four ways when the sickness of one of its members is considered.

First, the family defines the health status of its members to an important degree. When one feels ill, he goes first to the members of his family for confirmation, advice, or help. Most persons are sharply influenced by their wives, husbands, or parents in deciding whether or not to "play the sick role" (1)—to stay home from work, to remain in bed, to take medication, to consult a physician. And whether or not one allows family members to influence his decisions about illness with their overt advice, he will be influenced by his perception of their needs and attitudes. The child or grandparent who cannot otherwise win what he feels is sufficient attention from members of his family may be influenced toward playing the sick role by his expectation that "then they'll have to care for me." Or a parent may "refuse to give in," even to pronounced malaise, because he or she fears the consequences of ceasing to play his normal role. Moreover, the kind of family in which one lives determines to a large degree his definitions of sickness and health. The family's socioeconomic and educational position, for example, has been shown by Koos to determine members' ideas about physical health (2), and by Hollingshead and Redlich to influence one's perception of mental illness (3).

Second, the family provides direct support and care for sick members. The ability of a family to provide a suitable sickroom, to deal with the special needs of a sick person, and to

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give him the kind of warmth and support he may need at a time of crisis may spell the difference between home care and otherwise unnecessary institutionalization. Even when the sick person is hospitalized, the presence and support of members of his family may be crucial in motivating him to want to get well (4).

Third is the family's support of the sick member's use of professional help. In terms of dollars and cents, this support is obvious (as well as an obvious problem for many families). But family support of its member's use of professional services goes much further. There are the counsel, opinion, and pressure which help motivate the patient to select a physician, keep appointments, develop confidence in his judgment, and follow his advice (5). There are the ways in which family members may aid the sick person's therapy at the physician's request. And there is the willingness of the family to reevaluate and reorganize its activities so that the physician's recommendations may be carried out. These kinds of support can be seen most clearly, perhaps, in the family's, especially the mother's, role in caring for children, but they are present in every situation of illness of a family member.

Fourth is the family's adjustment to the results of sickness in the home. Can the family accommodate its activities and goals to the limitations imposed by the sickness of its member? Is there willingness so to do? What of the long pull, when temporary dislocations drag on and on? What of the emotional drain of worry about a loved one's health? Buell and his colleagues (6) have documented the fact that in more than half of the hard core problem families of St. Paul, Minn., chronic illness or physical handicap posed continuing adjustments that taxed family resources. It is probable that many of these became problem families because of their inability to overcome the difficulties which sickness imposed.

### Some Problems of the Family

When one examines the ways in which the family's organization impinges upon health care for older people, he is struck by the relevance of the organizational criterion of common goals. The question may be put this way: To

what extent are our old people solidary members of their families? Although more than three-fourths of persons 65 or older live in families, how many of those who live with children or other relatives are really accepted as wanted dwellers in the home? How many of these families have consensus among their members concerning the style and aims of family living? To what extent is there intergenerational conflict? (We know it tends to be most marked where there are differences in social class or cultural outlook between generations.) In the experience of the Jewish Hospital of Saint Louis, reaffirmed by directors of other home care programs, a fundamental criterion for admission of patients to home care is some degree of acceptance of and concern for the patient as a person by his family. Given this kind of family solidarity, desiderata concerning physical arrangements and personal interrelationships can often be worked out.

Parsons and Fox (7) have suggested that the increase in the use of hospitals during this century may be not a function merely of technical advances in medicine, but also of the inability of families to meet the challenge and strain of dealing with illness in the home. Not only have families grown smaller, living space less available for care of the sick, and wives less likely to be regularly in the home, but the responsibility of families to care for the aged and the ill is less clearly defined today than 50 years ago. With the development of hospitals and kindred institutions, the family whose organization lacks solidarity can avoid the difficulties of care for the ill with impunity by resorting to otherwise unnecessary institutionalization. While this may offer such a family a way out of a problem it has no wish to accept, it may also mean for the patient a proof of his rejection by the family.

The kinds of goals families set may also sharply influence their attitude toward professionals in the health services. Myers and Roberts (8) have pointed out that the experience of most lower class families is such that they are wary of, if not hostile to, authority figures. Cooperation is likely to be grudgingly given. And the weight of family sentiment in such situations may be in the direction of non-support of the patient's contact with health pro-

professionals, especially if the latter seem not to be undertaking direct physical care.

The family's knowledge concerning means to safeguard health varies with social class, educational level, and age of family members. In general, older families are likely to have less adequate health information than younger ones, and those of lower educational and social class levels are likewise apt to be disadvantaged. Moreover, among all three kinds of families it is likely that there is a particularly great amount of misinformation about the diseases of old age; too often, the warning signs of incipient chronic illness are dismissed with the thought that "he's just getting old." Similarly, not enough is known by lay persons about the degree to which palliative and rehabilitative measures can minimize or overcome some of the handicaps of old age.

Perhaps the family's principal role in promoting health lies in the practice of health-conserving measures. With better knowledge, families could not only help older people conserve their bodily resources more effectively, but could help people of middle age and younger avoid practices, such as allowing a condition of obesity to persist, which are known to foster the development of the chronic disabilities of old age.

Also families often do not know how they can participate in the care of the chronically ill. Frequently, families think that the only alternative to home care is institutionalization. Nor do they always realize how much patients who are unable to play their normal family role depend on the family to make them feel a part of a going concern. Certainly, if the family is to participate in the preservation of the health of its members, it must be given the information that will enable this organization to play its role on the health team.

The family's material resources are often inadequate to support the exigencies of chronic illness. Families, particularly those in the geriatric years when income is typically depleted, may be forced to forgo help that they need because of the cost of necessary medical care. Other resources for the care of sick members in the home are also often lacking. The institution of loan closets, equipment rental services, and similar services under the auspices

of hospitals, public health departments, or voluntary health agencies is an increasingly important method of helping families play a real role in the health team.

But the lack of family resources in chronic illness concerns not only the wherewithal to pay for medical care but also the potential significance of reduced income consequent upon the incapacity of a wage earner or the drain of paying for extra help to replace the contributions the sick member normally makes to the family (such as a homemaker to play the role of the incapacitated housekeeper). Making such services available, and helping to finance them as well, can often augment family resources enough to allow the family to provide care at home when otherwise institutionalization would be necessary.

Family personnel resources are often either inadequate to the challenges of chronic illness or become depleted by its demands. The absence of helping hands during a part of the day may make home care impossible. If neighbors can be co-opted to "look in" once in awhile or outside personnel can be brought in, the greater costs of hospitalization may be avoided. Similarly, family members can often acquire the skills needed to help with procedures otherwise requiring professional assistance. Giving injections of insulin to diabetics or helping bedfast patients with routine exercises are typical examples. More important, many families can competently care for the routine problems of family illness if they are assured of swift professional support when emergencies arise or conditions change for the worse. Physicians, with excessive demands on their services, often cannot make home visits readily. More precise arrangements for professional support, such as those established in home care programs, may be required.

Home care of the chronically ill is usually unrewarding, even to the professional, and the slow decline of a loved one is harder to bear than that of a patient. It is thus understandable that the motivation of family members to help in the care of the chronically ill may flag. And, lacking the objectivity of the professional, family members become involved emotionally in the discrepancy between a sick person's reactions and their expectation of that person's

behavior as mother, husband, or son. On both counts, family members often need help in re-evaluating their role and feelings about the illness. Sometimes a willing listener with a few words of wise counsel can spell the difference between a family member who wishes to wash his hands of the care of a chronically ill patient and one who is willing actively to help that patient as a member of the health team.

Finally, there is the task of coordination. Persuading the members of a family or any other organization to pull together efficiently toward a goal is always problematical; when the stress of illness within the family arises, the patterns of coordination which worked tolerably well during health may be shattered. Again, the support and counsel of professionals may help the family not only to adjust actively to the illness, but also to maintain its normal functions.

When illness or other crises require professional help, there is always the question as to whether the advice of the professional counselor can be accepted and coordinated into the family's attempts to solve its problems. This means, among other things, that the professional must understand not only the client but also his family. He must realize that the communication of his advice and of his willingness to help is not a simple process. Coordination in this respect requires a shared understanding and empathy between professionals, patients, and family members. It also requires similar understanding between doctors, nurses, physical therapists, social workers, and others about each other's role and about the situations of the families with whom all work. This is to suggest that understanding may become so difficult that it may require special efforts of coordination if it is to be achieved. The home care team must be carefully organized if it is to be effective in helping families care for the chronically ill in the home.

## Conclusion

Providing the services associated with home care programs can solve many of the problems that beset the family organization when it is confronted with the chronic illness of one of its members. However, the family's role in

health care transcends the demands that occur with the onset of illness; the family is instrumental in preventing illness, in determining appropriate action when illness strikes, and in supporting the patient's use of professional help.

Members of the health professions can help the family most effectively if they recognize its role and regard the family as the core of the health team in home care.

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## Visiting Nurse Service

EMILIE G. SARGENT, R.N., M.S.P.H.

For more than 75 years visiting nurse associations have been caring for the sick in their own homes under the direction of the patient's physician. The Detroit Visiting Nurse Association has had 62 years' experience in the care of patients at home and 4 years' experience with an organized home care demonstration program. Dr. Littauer has explained organized home care programs, and I will try to point out

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the differences between such programs and visiting nurse programs.

Visiting nurse associations are community agencies set up to supply nursing and ancillary health services to patients under the medical direction of the patient's physician. They are an urban development found in most cities of more than 50,000 population and are supported generally by federated financing and fees for services. Visiting nurse associations, like hospitals and health departments, have tried to adapt their services to scientific and social change. For example, the Detroit VNA added physical therapy to its services in 1926, occupational therapy in 1933, nutrition and mental health in 1938, homemaker service in 1955, and medical and social work consultation in 1956. Early emphasis was on maternal and child health and acute disease, but this has shifted in the past 15 years to long-term patients. Today the aged ill comprise about one-third of all patients of the visiting nurse associations.

With the advent of prepaid hospital insurance in 1940, hospitalization became popular. From 1945 to 1955 the Detroit Visiting Nurse Association tried with limited success to develop with hospitals patient referral plans to insure more continuity of care between hospital and home. Too many patients were losing the gains made in the hospital before the visiting nurse was called in. For this reason the VNA became interested in the home care plan of Montefiore Hospital of New York City and asked the council of social agencies to advocate a similar plan for Detroit. Eight years went by and it became evident that if Detroit was to have a home care plan, the visiting nurse association would have to take the initiative. A grant from the McGregor Fund, a local foundation, made it possible to conduct a demonstration for a 4-year period.

The VNA followed the currently accepted pattern for an organized home care program except that only patients of private practicing physicians were admitted, and the team of physician, nurse, and social worker served as consultants and gave no direct patient care. The grant of \$25,000 each year paid the expenses of the team and a secretary. The expense of the private physician's care was carried by the patient, while the health services were provided by

the community agencies following their own policies of charging or not charging for services.

The Detroit 4-year demonstration resulted in acquainting more physicians and more hospital personnel with the value of home care services because interpretation of the plan was an important part of the responsibility of the team and a representative community advisory committee. A few hospitals set up a system of referring patients to community agencies. Another byproduct of the demonstration was that the team helped the staff of the association improve methods of work and give more rehabilitative services to all its patients.

The limiting factor of the demonstration was the number of patients. The team of 3 could not carry more than an average of 45 patients in the home care demonstration because of the many time-consuming conferences and reports connected with the admission, progress, and discharge of the patients. These 45 were selected from the visiting nurse association's daily caseload of 1,000 long-term patients. The expenses of the team added \$1 to the cost of each visit made by the VNA staff to demonstration patients.

The reports of other home care programs indicate that the daily average of patients for most of the 60 plans is under 50 patients. The Detroit home care program served 10 aged patients a day in contrast to 600 in the over 65 age group served by the visiting nurse association. The 10 were selected because they needed multiple services and had social problems, the criteria for admission of a patient to the home care demonstration. It might be inferred that only 10 out of the 600 aged needed the special coordinated services of the home care demonstration team, and for 590, the regular visiting nurse association service was adequate.

In my experience, administering a home care program according to the currently established pattern has pointed up the fact that not enough consideration has been given to the potentials of the more than 700 existing visiting nurse associations and of the thousands of health departments that could establish a home treatment service as the quickest and most economical way of bringing necessary services to the aged in their homes. The majority of aged patients

are under their family physician's care; 90 percent of the aged patients of the Detroit association receive medical care from physicians in private practice.

The hospital must supply the bridge to home care. Every hospital has a responsibility to plan for patients needing continued medical and nursing care after discharge. If the patient has a private physician, he, of course, is captain of the planning team. Hospitals set up certain routine procedures which physicians who bring their patients to that hospital must follow. It would seem that a system of planning for the patient who needs continuing care after hospital discharge could be part of such established hospital policy.

Public hospitals and voluntary hospitals that care for many chronically ill indigent patients may wish to have a home care department to extend services to their discharged patients. However, in my opinion the nonindigent post-hospital patient can be well cared for in the home by the simpler and less expensive method of a centralized system to refer patients to a community agency, such as the visiting nurse association, which will coordinate with other agencies whose services are needed by the patient.

In any event, the community planning and financing bodies should participate in the decision on which kind of home care service is best adapted to their community, because community funds will be needed to finance programs in the hospital and the home.

## *Community Homemaker Service*

MARIAN R. STANFORD, M.D.

In New Jersey, community homemaker service has demonstrated its value as one of the important basic resources for preserving homes threatened by the absence or incapacity of the person who formerly carried the chief responsibility for family care and home management. This service is proving especially valuable in

meeting the needs of older persons living in their own homes. Community homemaker service in New Jersey is a locally sponsored nonprofit activity to place well-qualified, trained women in households where they are needed because of illness or disability or other family emergency. Its primary objective is to preserve and strengthen family life, whether it is primarily focused on serving children, the aged, the chronically ill, the physically handicapped, or the emotionally disturbed.

Upon request, the local agency places the worker after evaluation of the home situation. The hours of service may vary according to the family's need, usually 2 to 6 or 8 hours. Full or partial payment for the service is an obligation of the family or the community or welfare agency if the family cannot afford to pay. The homemaker receives \$1.25 per hour and transportation costs. Many of the agencies, although partially supported by community funds, are finding it necessary to add a small administration fee for their services.

Homemakers are mature women selected for their personality, dependability, good health, and special interest in helping people. After screening and acceptance by the local committee, they take a standardized 20-hour training course. The course is sponsored and financed by the New Jersey State Department of Health and administered through the extension division of Rutgers, the State University. Those who complete the course satisfactorily receive a certificate. Upon acceptance for service by the agency, the homemakers are required to have a physical examination, carry a health card, and wear a uniform with identifying insignia. The homemaker is periodically supervised on the job. She is required to report on each case and confer frequently with her supervisor. These reports and conferences provide evidence of her competence, of her reaction to illness and family situations and to the work she is performing. She aids the agency in evaluating the needs of the family and the length of service required. Her observations often are helpful to the supervisor and the physician. As an employee of the agency she is covered by workmen's compensation, public liability insurance, and social security.

In our changing society many factors have

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contributed to the urgent necessity of reevaluating and redirecting community supportive services in terms of more adequately meeting present-day needs. This is equally true of community homemaker service, which should periodically be reviewed in relation to the whole new concept of home care and rehabilitation. Many illnesses can often be treated more effectively at home if adequate help is available to maintain the home and relieve the stresses related to long-term illness. The rising incidence of chronic illness concomitant with our increasing lifespan, as well as other trends in our present-day living, has created an increased need for various kinds of help in the home. Today we can no longer look on homemaker service as merely available to meet crises in the home; we see it as a preventive measure and a restorative service.

Community homemaker service helps to prevent a breakdown in the orderly management of the household because of illness or other family emergency and frequently encourages the family to help itself. It may prevent the lack of adequate supervision of children, poor family nutrition, disproportionate burdens on some members of the household which could produce fatigue, worry, anxiety, resentment, and hostility, absence from work of an employed family member with loss of income, and absence from school of older children. Physicians say the service has prevented temporary breakup of the household, unnecessary removal of sick persons from familiar surroundings to institutions, and placement of children with relatives or in foster homes.

From the standpoint of the community, our records show that homemaker service frees hospital beds for the acutely ill, decreases the demand for custodial facilities, and eliminates the cost of avoidable institutional care.

Various kinds of home helps should be used interchangeably for any particular family. There should be a careful appraisal of the individual family members and of the family as a whole in order to determine the type of service most suited to meet its needs. Families are referred to other appropriate agencies when referral is indicated. The homemaker is carefully selected so that she may prove to be the right person for the particular situation.

Homemakers assigned to homes with chronically ill patients are prepared with special in-service training. Demonstrations are a part of this training so that she is capable of carrying out delegated personal care measures under nursing or medical supervision and within the policies of the agencies.

A conference at Arden House held February 14-16, 1960, under the sponsorship of the National Health Council, was held for the purpose of preparing a statement on personal care services as related to community homemaker services and the necessary standards, training, and supervision required.

The need for health emphasis in homemaker training was highlighted by a Public Health Service study which revealed that 93 percent of the families receiving homemaker services during a specified period of time in 1958 had one or more ill members or needed a homemaker because of the absence of a member of the family who was hospitalized.

In 1950 a homemaker service specifically designed to meet the needs of long-term patients was started in Essex County, N.J., under the sponsorship of the county medical society. Carefully selected mature women worked part time to perform this service. This pioneering experience in Essex County was very helpful when a statewide program was started 2 years later.

This statewide program in New Jersey came about through the passage of the Prevention of Chronic Illness Act of 1952. The law contained a provision requiring the State department of health "to plan for the provision of adequate visiting nurse and housekeeping aid services by appropriate public or private agencies throughout the State, to the end that the nursing and medical care being furnished to the chronic sick in their own homes shall be improved in every manner possible."

A State consultant committee of women volunteers representing many skills was appointed by the commissioner of health to work with the newly created division of chronic illness control to promote the development of homemaker service throughout the State. A manual of procedure for establishing a homemaker service was developed, a course of study for homemakers was prepared, and a grant-in-aid was

given to Rutgers to implement the course on the local level. Suggested standards for operation of a homemaker service, educational pamphlets, a filmstrip, and a movie, "Home Again," were then prepared. State and local conferences were held to inform the public about the service.

Members of the consultant committee, which include directors of homemaker services and representatives of official agencies, meet with representatives of local organizations to assist them in starting a service and arranging for the training course. In each instance the homemaker service is encouraged to tailor its program to fit local needs. In the early days, the community homemaker service was operated entirely by volunteers, but the demand for service soon became too great for volunteer effort alone. To demonstrate the importance of adequate continuing supervision of the homemaker and to assist the agency in providing well-qualified directors, the division has made some temporary grants to agencies. However, the rapidly increasing demand for this service and the emerging new look for community homemaker service has necessitated not only one full-time director, but in the larger services, an assistant director. In most instances, the directors have a social work or public health nursing background. We are now developing a training course for directors. We are becoming increasingly aware of the need to make this service available on a 24-hour, 7-day-a-week basis. We understand that a homemaker service in Fort Lauderdale, Fla., has some homemakers willing to give 24-hour service. New Jersey currently has 16 services in 14 of 21 counties. More than 400,000 hours of service were given last year by 11 services in an area covering two-thirds of the State.

In summary, experience in New Jersey and elsewhere shows homemaker service to be a valuable adjunct to medical and nursing service for the homebound patient. It has the dual advantage of releasing hospital beds for the acutely ill and reducing the cost of patient care by using the facilities of the patient's own home. It boosts the morale of both patient and family through the simple expedient of maintaining a well-organized household. As a by-product of the service, it has been noted that

often in becoming "useful" again, the homemaker takes a new lease on life.

The homemaker is a helping person trained to give a special kind of service which contributes importantly to the total effort of meeting family needs. She complements rather than substitutes for or competes with a community visiting nurse or practical nurse.

If the best resources a community has to offer in womanpower, financial aid, and citizen and group interest are all coordinated in the establishment and promotion of a homemaker service, its success is assured.

## *Trends in Home Care*

FRANZ GOLDMANN, M.D.

If the best prophet of the future is the past, as Byron once said, then certain predictions about the growth of home care in the next 5 or 10 years appear justified by the trends that have become manifest.

In the years to come, increasing attention will be given to the development of organized programs of home care as distinguished from provision for payment for house calls by physicians and nurses. Ideally, organized programs of home care cover all the services needed by homebound patients regardless of their condition or disease, encourage teamwork of the various types of professional and auxiliary personnel, and foster high quality of service. The prerequisites for the attainment of these objectives are a service organization promoting high quality of service, a payment organization providing for the support of all essential services, and an administrative organization assuring high quality, efficiency, and economy of service.

At present, practically all the organized programs of home care limit eligibility to persons with very low incomes and the indigent. In the future they are likely to be made available to substantial numbers of self-supporting people, regardless of income, through extension of Blue Cross benefits and further growth of

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group-practice prepayment plans. This means a gradual shift in the major source of support for home care programs from public assistance to insurance.

With increases in the number of insured persons eligible for home care services, short-term care as well as long-term care in the patient's own home will be made easier. This will be a significant departure from the present policy of using home care programs mainly, if not exclusively, for the care of chronically ill and disabled people.

There is good reason to assume that elderly people will continue to make up a large proportion of the persons served by organized home care programs in view of the high prevalence of physical impairment among this age group. It is important to keep in mind that many of the patients on home care will receive continued service over long periods, exceeding 2 years in many instances.

The lessons learned from the operation of home care programs in the past may be summarized as follows. First, properly organized and supervised home care is advantageous to the sick because it permits service in the usual environment, assures continuity of care upon discharge from the hospital, and reduces their total medical bills, all matters of particular importance to senior citizens. Second, properly organized and supervised home care contributes to the best possible utilization of expensive hospital beds by facilitating early discharge and preventing unnecessary admission. It reduces capital expenditures for new hospital beds. It does not lower the operating costs of hospitals, as decrease in the average length of stay of patients spells increase in the average daily hospital costs.

Third, organized home care programs are an additional resource, not a cheap substitute for costly hospital care. They are essential to attainment of both progressive patient care and comprehensive medical care. Fourth, home care should be provided only if the clinical condition of the patient makes such service necessary and feasible, the physical environment is suitable, and the psychological attitudes of both patient and family are favorable. Close

working relationships of the programs with hospitals are essential to effective service.

Continued observation of a sample of patients on home care over half a year has produced much new material on the characteristics and experience of such patients. It has supplied ample evidence of the value of organized home care to the patients and especially of the preventive aspects of continuous care by teams of physicians, nurses, social workers, physiotherapists, and others. It also reveals that readmissions to hospitals are frequent. A detailed report on this study appears in the January 1960 issue of the *Journal of Chronic Diseases*.

There are many questions concerning home care that require careful consideration. Only a few can be mentioned here.

1. Is it not time to revise the idea that after-care of patients discharged from the hospital is the primary function of home care programs? Would it not be wise to use such programs also to reduce the need for hospitalization?

2. What is the best method of organizing the services of physicians under organized programs of home care? Would it not be possible to assure high standards and at the same time save physicians' time by organizing home care programs on the basis of districts in the community and link these programs closely to hospitals in the respective districts?

3. Why are homemaker services covered so infrequently? Is it lack of available personnel or of proper supervision of homemaker services? Long experience with visiting homemaker service in some western European countries indicates that the task is by no means insuperable.

4. How is the general public likely to react to the proposition of home care after it has been thoroughly indoctrinated with the idea that the hospital is the center of good professional services?

5. Is it reasonable to assume that an industrial society and an apartment civilization allow children to keep in their households disabled parents requiring more than occasional assistance and care?



# Sanitary Engineering Degrees Awarded in 1959

Institution	Doc- tor's	Mas- ter's	Bach- lor's	Institution	Doc- tor's	Mas- ter's	Bach- lor's
Alabama Polytechnic Institute.....	-----	2	( <sup>1</sup> )	New Hampshire, University of.....	-----	( <sup>1</sup> )	-----
Alabama, University of.....	-----	0	0	New Mexico College of Agricul- ture and Mechanic Arts.....	-----	0	2
Arkansas, University of.....	-----	0	-----	New York University.....	0	2	4
Arizona, University of <sup>2</sup> .....	0	0	1	North Carolina State College.....	0	2	-----
Brooklyn, Polytechnic Institute of.....	-----	0	-----	North Carolina, University of.....	0	<sup>3</sup> 7	-----
California Institute of Tech- nology.....	0	0	2	North Dakota, University of.....	-----	0	0
California, University of.....	<sup>3</sup> 2	<sup>3</sup> 8	0	Northeastern University.....	-----	5	0
Case Institute of Technology.....	0	<sup>3</sup> 2	-----	Northwestern University.....	0	<sup>3</sup> 7	-----
Cincinnati, University of.....	-----	0	1	Ohio State University.....	0	<sup>3</sup> 1	2
Colorado, University of.....	-----	0	0	Oklahoma State University.....	0	0	4
Connecticut, University of.....	-----	0	-----	Oklahoma, University of.....	0	<sup>3</sup> 16	0
Cornell University.....	1	0	0	Oregon State College.....	0	2	3
Florida, University of.....	0	6	9	Pennsylvania State University.....	1	2	1
Georgia Institute of Technology.....	0	1	5	Pittsburgh, University of <sup>2</sup> .....	1	<sup>3</sup> 8	0
Harvard University.....	1	<sup>3</sup> 11	0	Puerto Rico, University of.....	-----	-----	0
Idaho, University of.....	-----	0	0	Purdue University.....	0	5	<sup>3</sup> 4
Illinois Institute of Technology.....	0	0	-----	Rensselaer Polytechnic Institute.....	-----	9	4
Illinois, University of.....	0	<sup>3</sup> 3	3	Rhode Island, University of <sup>2</sup> .....	-----	0	-----
Iowa State University.....	0	<sup>3</sup> 3	0	Rice Institute.....	-----	( <sup>1</sup> )	-----
Iowa, State University of.....	1	3	11	Rutgers University.....	1	2	4
Johns Hopkins University.....	2	<sup>3</sup> 8	-----	South Dakota State College.....	-----	1	2
Kansas, University of.....	-----	1	4	Southern California, University of.....	-----	5	-----
Kentucky, University of.....	-----	0	0	Southern Methodist University.....	-----	0	-----
Maine, University of.....	-----	1	4	Stanford University <sup>2</sup> .....	1	<sup>3</sup> 6	2
Manhattan College <sup>2</sup> .....	-----	-----	16	Syracuse University.....	-----	( <sup>1</sup> )	( <sup>1</sup> )
Marquette University.....	-----	-----	12	Tennessee, University of.....	-----	0	-----
Maryland, University of.....	-----	( <sup>1</sup> )	( <sup>1</sup> )	Texas Agricultural and Me- chanical College.....	0	<sup>3</sup> 1	3
Massachusetts Institute of Tech- nology.....	<sup>3</sup> 3	<sup>3</sup> 9	-----	Texas Technological College.....	-----	0	12
Massachusetts, University of.....	-----	0	0	Texas, University of.....	1	<sup>3</sup> 4	0
Michigan College of Mining and Technology.....	-----	0	14	Tulane University of Louisiana.....	-----	1	0
Michigan State University.....	0	1	-----	Utah, University of.....	0	0	1
Michigan, University of.....	0	<sup>3</sup> 23	1	Virginia Polytechnic Institute.....	0	2	6
Minnesota, University of.....	0	<sup>3</sup> 10	0	Washington State University.....	-----	1	0
Mississippi State College.....	-----	0	0	Washington University.....	0	3	<sup>3</sup> 21
Missouri School of Mines and Metallurgy.....	-----	2	<sup>3</sup> 8	Washington, University of.....	0	1	0
..... of.....	-----	<sup>3</sup> 4	0	West Virginia University.....	-----	0	0
Nebraska, University of.....	-----	0	-----	Wisconsin, University of.....	1	<sup>3</sup> 5	1
Newark College of Engineering.....	-----	1	9	Wyoming, University of <sup>2</sup> .....	-----	0	0
				Total.....	16	197	182

<sup>1</sup> Data not available for 1959.

<sup>2</sup> Schools reporting for the first time in recent years.

<sup>3</sup> Includes foreign nationals.

NOTE: Leaders (-----) indicate no specialization offered at this level.

Educational activity in sanitary engineering, as measured by the number of degrees awarded, showed a strong upward surge in the academic year ending June 1959 and approached the 1951 peak for the first time. In particular, the number of graduate degrees conferred reached a new high. Data on degrees given during the period July 1958 through June 1959 are presented in the table (see above). Similar data for the

period since 1889 appear in the literature (1-4) or have been distributed by the Public Health Service. The data for 1958-59 are more complete than in past years in that nearly all schools offering a program in sanitary engineering at any level are represented.

Briefly, there were 213 graduate degrees in sanitary engineering conferred by institutions in the United States during the 1958-59 aca-

# Engineering degrees awarded annually, by type of degrees, 1951-59

Year	Number sanitary engineering degrees	Schools awarding sanitary engineering degrees	Schools offering sanitary engineering curriculums	Total number engineering degrees <sup>1</sup>	Number sanitary engineers per 1,000 engineering degrees
Bachelor's degrees					
1959	182	32	54	38,134	4.8
1958	148	33	45	35,332	4.2
1957	145	31	43	27,748	5.2
1956	208	32	53	23,547	8.8
1955	141	32	44	20,200	7.0
1954	164	32	40	19,707	8.3
1953	216	36	41	21,642	10.0
1952	216	36	41	27,155	8.0
1951	244	35	39	37,904	6.4
Master's degrees					
1959	197 (52)	43	69	6,615	29.6
1958	128 (29)	35	61	5,788	22.1
1957	152 (39)	41	64	5,203	29.2
1956	124 (31)	33	67	4,678	26.5
1955	134 (34)	33	53	4,444	30.2
1954	120 (25)	30	56	4,130	29.1
1953	102 (20)	25	57	3,726	27.4
1952	105 (22)	29	57	4,132	25.4
1951	152	26	57	5,134	29.6
Doctor's degrees					
1959	16 (2)	12	37	714	22.4
1958	16 (4)	12	36	647	24.7
1957	11 (1)	6	32	596	18.5
1956	9 (1)	7	27	610	14.8
1955	11 (2)	4	28	599	18.4
1954	9	5	26	590	15.3
1953	5	4	24	592	8.4
1952	9	5	23	586	15.4
1951	7	4	25	586	11.9

<sup>1</sup> See Tolliver, W. E., and Armsby, H. H.: Engineering enrollments and degrees in ECPD-accredited institutions, 1959. *Journal of Engineering Education* 50: 450-467, Feb. 15, 1960.

NOTE: Figures in parentheses represent nationals of other countries included in larger figure.

ademic year. Of these, 197 were master's degrees and 16 were doctor's degrees. This is an increase of 69 over the 144 such degrees reported for the 1957-58 academic year. The entire increase, about 48 percent, was in the master's

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degree category, as the same number of doctor's degrees were conferred. Five of the schools appearing on the graduate listing this year for the first time reported a curriculum at the master's degree level. Three of these schools conferred 14 master's degrees. The 69 institutions which reported in the master's degree category both this year and last awarded 55 more master's degrees this year.

Awards of bachelor's degrees also rose this year, but the total was smaller than has been

reported in some previous years. In the 1958-59 academic year, 182 bachelor's degrees were awarded to students who had completed undergraduate programs emphasizing sanitary engineering. This was an increase of 34 degrees over the 148 conferred for the academic year 1957-58. Five schools appear on the undergraduate listing this year for the first time, and 19 bachelor's degrees were awarded by three of them. The 49 schools which reported in the bachelor's degree category both this year and last awarded 15 more degrees this year, an increase of about 10 percent.

A more detailed discussion of each degree category follows. It refers both to the table giving 1959 graduates by school and to the table which shows a comparison of degree statistics for the period 1951-59.

### Bachelor's Degrees

Fifty-four schools reported a sanitary engineering option or equivalent electives in their undergraduate curriculums. Of these, 22 conferred no bachelor's degrees in this field for the academic year 1958-59 (see table on p. 1147). The 32 schools awarding degrees conferred a total of 182, of which 4 were awarded to foreign students. As in past years there was fairly heavy concentration in a few schools. Ten schools awarded 121 degrees or nearly 66.5 percent of the total. The level of bachelor's degrees awarded in 1958-59 was the highest in the last 3 years, exceeding the average of 165 for the past 5 years, but falling below the average of 195 for the past 10 years.

It is difficult to judge how accurate these figures are. Sanitary engineering at the undergraduate level has rarely been organized in the form of a separate department. More often sanitary engineering courses comprise an option in the civil engineering curriculum. Because of this, there is no consistent pattern for the reporting of baccalaureate degrees in sanitary engineering. Some institutions offer a concentration of sanitary engineering courses such as might be found in an elective sanitary engineering option of a civil engineering curriculum. Others are reporting students who may have taken several elective courses in sanitary engineering beyond the few such courses required of

all registrants in the civil engineering curriculum. A few of the figures may indicate civil engineering students who have taken only the required courses which fall under the general heading of sanitary engineering. In such situations it would be difficult to say that the figures in this report indicate a particular trend in sanitary engineering manpower. The reporting of them, however, provides continuity in the record of this information and at least a rough measure of the direction of activity in sanitary engineering at the undergraduate level.

### Master's Degrees

Of the 69 schools reporting a curriculum in sanitary engineering at the master's level, 26 did not confer any master's degrees in the field of sanitary engineering. The 43 schools which did confer degrees awarded a total of 197, of which 52 were awarded to foreign students. A large proportion of the master's degrees were conferred by a fairly small group of the schools. Nine schools awarded 102 degrees, or about 51.8 percent of the total. The total of 197 degrees was the highest ever recorded for the sanitary engineering field at the master's degree level, and indicates a sharp rise over the prevailing level of past years. Some of the increase reflects the inclusion in the compilation for 1958-59 of more schools than were represented in past surveys. For the 10-year period 1950-59, the average number of master's degrees awarded in sanitary engineering was 136. Over the past 5 years this average was about 147 degrees.

There is an increasing trend to consider the master's degree to be the qualifying level of training for work in the sanitary engineering field. This was brought out in the "Conference Report of the 1957 Conference on Education, Training and Utilization of Sanitary Engineers," and adds significance to the substantial increase in the number of master's degrees awarded in the academic year 1958-59. The total of 197 degrees is so far above the relatively stable level of recent years that there is reluctance to use this as a firm base for predictions on the future of sanitary engineering training at this level. It is interesting to note the increase in both the number of schools offering the sanitary engineering curriculum and those award-

ing degrees during the 1958-59 academic year. This situation indicates that interest in the field is being sustained and perhaps heightened.

A major problem in such an evaluation has been those schools which offer a master's program in sanitary engineering but have not had students completing this program. Twenty-six schools which reported no degree awards during 1958-59 have conferred a total of only 57 master's degrees since 1950, an average of slightly more than 2 degrees per school over the entire 10-year period. The percentage of schools actually granting master's degrees has been on an upward trend, however, indicating an increased interest on the part of both schools and students.

### Doctor's Degrees

There were 37 schools reporting a program in sanitary engineering leading to the doctor's degree. Of these, 25 granted no degrees during the 1958-59 academic year. The remaining 12 schools reporting degree awards conferred a total of 16, of which 2 went to foreign students. As might be expected, all of the schools having a doctoral program also have a master's program. In the last 10 years a total of 97 doctor's degrees have been awarded to students specializing in sanitary engineering. Over that same period of time, the 12 schools which reported degree awards for 1958-59 accounted for 81, about 83 percent of the total. Again, this indicates the concentration of activity in the field of sanitary engineering training. The number of doctor's degrees awarded in 1958-59 was the same as for 1957-58, remaining at a high level compared with earlier years. The average number of doctor's degrees awarded per year over the 10-year period 1950-59 was 9.7. The 5-year average now stands at 12.6 degrees.

Since the past 5 years have seen a relatively high level of doctor's degree awards, and since there appears to be an increase in the number of master's degrees conferred, it would seem likely that the number of doctor's degrees will continue as high as or higher than it has been in the past several years. It should be noted that the concentration of degree-awarding institutions is greater at the doctoral level than at

either the bachelor's or master's level. While this situation indicates a present lack of students, the schools which now have no doctoral students represent a future potential source of teaching and research personnel. This could be particularly significant if activity at the bachelor's and master's levels is to increase, for if more students are enrolled at these lower levels, there will be a greater demand for teaching and research personnel. There is an increasing demand that such personnel hold the doctorate.

### Current Graduate Enrollment

For the first time since this survey was started, figures have been collected which indicate the current enrollment of students in sanitary engineering programs leading to master's and doctor's degrees.

The figures for the 1959-60 academic year are gross figures showing simply those students enrolled in any form of graduate program in sanitary engineering. There is no breakdown as to length of program and no breakdown as to the concentration of study. In other words, the figures do not indicate how many students are studying full time, how many are studying half time while teaching or doing research, or how many students are enrolled in evening study programs.

Nevertheless, these enrollment figures are the beginning of what will become a regular part of this annual report. They will be so collected in the future that the groups noted above can be broken out and analyzed. It is hoped that such figures will form the basis for yearly predictions of graduate degree awards. During the coming year, schools offering sanitary engineering graduate programs will be contacted in an effort to obtain enrollment figures for the past several years. Such a statistical history will more quickly provide a basis for analyses of training capacity.

For the 1959-60 academic year, there are 413 students enrolled in master's degree programs and 118 enrolled in doctoral programs. The master's degree students are enrolled in a total of 58 schools, while the doctoral candidates are studying in 33 schools. These latter figures show the high percentage of engineering schools

now actively engaged in graduate programs. While 43, or about 62 percent of the schools offering master's programs, granted degrees in 1958-59, there are students enrolled in 58, or about 84 percent of these schools, in the 1959-60 academic year. This indicates heightened activity and means that there will be less concentration of students than in the past several years. The same is true of the doctoral candidates. While only 12, or about 32 percent of schools offering doctoral programs, granted degrees in 1958-59, there are students enrolled in 33, or more than 89 percent of these schools, in the 1959-60 academic year.

With information on only 1 year, it would not be wise to make any predictions or to cite any trends in activity or future degree awards.

However, the high level of enrollment in the various schools certainly indicates a healthy situation and an increased interest in the field of sanitary engineering study and instruction.

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*Facts About Strokes.* 1960; leaflet. American Heart Association, 44 East 23d Street, New York 10.

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*Handbook of Aging and the Individual.* Edited by James E. Birren. 1959; 939 pages; \$12.50. University of Chicago Press, Chicago.

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*Aging—Public Welfare's Role.* 1960; 20 pages; 50 cents (discounts on large orders). American Public Welfare Association, 1313 East 60th Street, Chicago 37.

#### SEC Technical Reports

A limited number of the following reports are available from the Robert A. Taft Sanitary Engineering Center, Public Health Service, Cincinnati, Ohio. Order by number.

*Air Monitoring and Sampling Networks.* Proceedings of the 1959 seminar. Technical Report A60-3. 1960; 135 pages.

*Air Pollution From Alfalfa Dehydrating Mills.* Technical Report A60-4. 1960; 25 pages.

*Air-Borne Particulate Emissions From Cotton Ginning Operations.* Technical Report A60-5. 1960; 20 pages.

*Air Pollution in South Carolina.* Technical Report A60-6. By Paul A. Kenline. 1960; 26 pages.

*Treatment of Wastes From Coffee Processing in Costa Rica.* Technical Report W60-2. By Herbert R. Pahren and Rudolfo F. Saenz. 17 pages.

*Biological Problems in Water Pollution.* Transactions of the 1959 seminar. Technical Report W60-3. Compiled by C. M. Tarzwell. 1960; 285 pages.

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# Estimated Morbidity in the United States Based on Monthly Labor Force Report

PHILIP E. ENTERLINE, Ph.D., and WILLIAM H. STEWART, M.D.

SINCE 1943 the U.S. Bureau of the Census has been conducting monthly interviews of a representative sample of the noninstitutionalized civilian population of the United States. The primary purpose of these interviews is to obtain estimates of the total labor force, employment, unemployment, and number of workers outside the labor force.

Starting in July 1947 estimates have been published monthly of the number of employed persons 14 years of age and over who did not work at all the week preceding an interview because they were ill (1, 2). This is the longest continuous series of estimates on illness available for the United States. The magnitude of the sample interviewed permits rather detailed comparisons of reported illness with social and demographic data. From July 1947 until May 1956, a total of about 21,000 households were interviewed each month. Starting in May 1956 the number was increased to 35,000 households. It is the purpose of this paper to evaluate these data.

In judging data relating to illness it is important to keep in mind the distinction between illness as a concept and the manner in which this concept is measured. A concept is simply an idea of what a thing in general should be. Any particular measure of a concept is most useful if it is known how the measure was derived and if these methods satisfy the requirements of the user. Illness data from the labor force survey represent responses to questions which are presented in the technical note at

the end of the paper. These responses were obtained under conditions specified there and more fully in publications relating to the labor force survey (1-3).

It is not always easy to judge the usefulness of data by examining a necessarily limited description of the procedures by which the data were derived. It is not known, for example, how closely interviewers for the labor force survey followed the instructions provided to them, or to what extent respondent replies reflect situations as they actually existed. Some help in evaluation is provided if it is known whether data vary apparently in response to the same stimuli as other data designed to measure illness. This report will be devoted mainly to comparisons of illness data from the labor force survey with other data about illness in the United States.

## Illness Trends

Figure 1 shows the percentage of the total noninstitutionalized employed civilian labor force found on each monthly survey not to have worked at all the week preceding the interview because of illness. Also shown is a 12-month moving average. The monthly percentage reported not working because of illness generally ranged between 1 and 2 percent during the period July 1947 through September 1959, with rates in excess of 2 percent occurring only in February 1953, and October and November 1957. The 12-month moving average shows no overall trend, although the general level of illness appears to have been somewhat lower during the period 1949 through 1954 than in other years.

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A series on illness with which these data can be compared relates to the Armed Forces. This series shows the average daily proportion of total manpower unavailable for duty during each month because of illness (4-6 and personal communications from Dr. Wilbur V. Charter, Bureau of Medicine and Surgery, U.S. Navy, and Eugene Hamilton, Medical Statistics Division, U.S. Army). In the table and in figure 2, these data are compared with data derived from the labor force survey for the employed civilian labor force. Monthly data are available for the Air Force and the Navy only since July 1949.

Prior to 1955 the prevalence of illness in the Armed Forces, particularly in the Army, was relatively high, possibly reflecting some effect of the Korean conflict. The high prevalence of illness in the Army during 1947 and 1948 was apparently an aftermath of World War II.

Starting in 1955, the trends and fluctuations in rates are similar for all four series of data. Also starting in 1955, the general level of illness for the Armed Forces was similar to the level of illness in the civilian labor force series. Since the latter refers to illnesses mainly of a week's duration or longer, a somewhat lower rate might be anticipated. One reason for similar levels of illness may be that the civilian working population is older than the military, and illness tends to be positively associated with age; hence the age difference may partly offset the effects of the longer periods of illness to which the labor force data are limited.

### Seasonal Variation

Figures 1 and 2 show very definite seasonal variations in the prevalence rate for illness in the employed civilian labor force. These seasonal variations tally quite well with those appearing in data for the Armed Forces, as is shown on figure 2, with a peak appearing in February and with relatively low rates for June, July, and August. They also tally well with other data available for civilian populations. In a study of illness in Baltimore for the years 1938-43, with visits at regular monthly intervals by interviewers experienced in morbidity surveys, the prevalence rate for persons disabled by illness on the day of the

visit was found to be highest in February and lowest during the summer months (7).

Starting in May 1955, data have been collected each month in the labor force survey on persons 14 years of age and over working part-time (less than 35 hours) the week preceding the interview because of illness. (Since July 1959, these data have been published monthly by the Department of Labor in *Employment and Earnings*, table A-16). The addition of these data to estimates of the number of employed persons 14 years of age and over who did not work at all the week preceding the interview because they were ill provides an estimate of all illness causing work loss in the civilian labor force.

Figure 3 shows the percentage of the employed civilian population absent on an average day because of illness during each quarter in the period July 1955 through September 1959. Starting with the third quarter of 1957, estimates derived from the labor force survey are compared with estimates from the National Health Survey (8 and unpublished data). Seasonal variations are quite similar in these two series. Starting in the summer of 1958, the prevalence of illness is also quite similar.

It is not certain why estimates from the labor force survey are appreciably lower than those from the National Health Survey during the fall of 1957 and the spring of 1958. The National Health Survey was a new activity in 1957, and it is possible that its newness was somehow associated with these higher reported rates of illness. There are many methodological differences between the two surveys which could be responsible for differing results. The purpose of the comparison in figure 3 was mainly to see if seasonal variations in illness reported in the labor force survey are generally consistent with those observed in a study of the civilian population of the United States designed more specifically to measure illness.

### Deviations From Expected Rates

Figure 4 shows for the labor force survey the difference between the observed monthly prevalence of employed persons reported not working at all the week preceding the interview because of illness, and an expected monthly

Figure 1. Prevalence of illness in the employed civilian labor force resulting in work loss of a week or more, by month, July 1947–September 1959

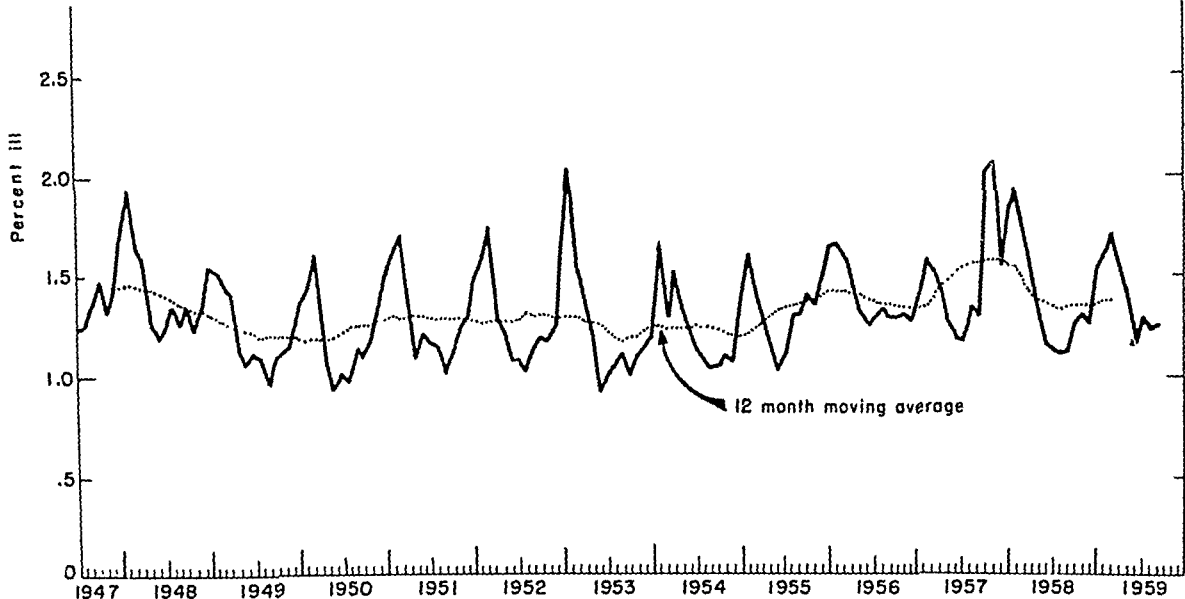
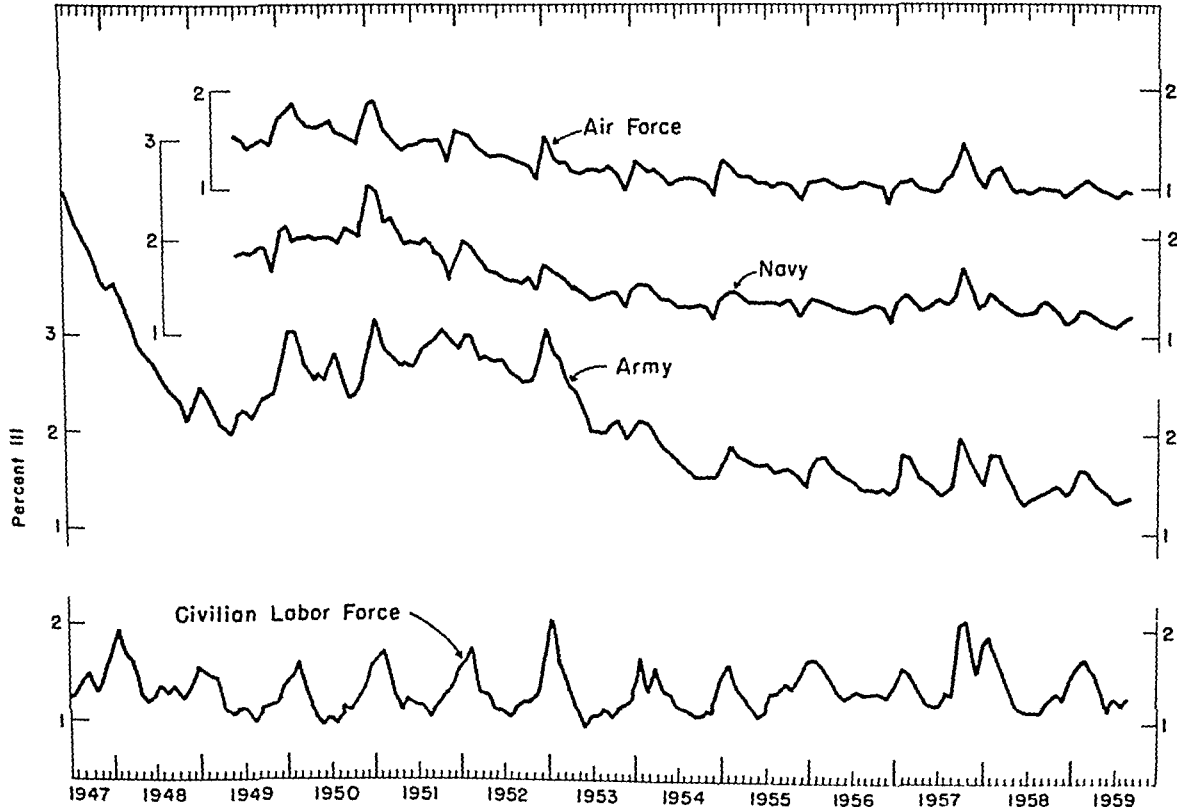


Figure 2. Prevalence of illness in the Armed Forces resulting in excuse from duty of a day or more, and in the employed civilian labor force resulting in work loss of a week or more, by month, July 1947–September 1959





Prevalence of illness in the employed civilian labor force resulting in work loss of a week or more, and in the Armed Forces resulting in excuse from duty of a day or more, by month, July 1947–September 1959

Month and year	Employed civilian labor force (percent)	Armed Forces			Month and year	Employed civilian labor force (percent)	Armed Forces		
		Air Force (percent)	Navy (percent)	Army (percent)			Air Force (percent)	Navy (percent)	Army (percent)
1947					1950				
July.....	1.23	(1)	(1)	4.52	August.....	.97	1.69	2.00	2.80
August.....	1.26	(1)	(1)	4.30	September.....	1.14	1.57	1.95	2.63
September.....	1.36	(1)	(1)	4.08	October.....	1.09	1.51	2.11	2.37
October.....	1.49	(1)	(1)	3.97	November.....	1.18	1.50	2.06	2.39
November.....	1.32	(1)	(1)	3.81	December.....	1.34	1.44	2.01	2.54
December.....	1.43	(1)	(1)	3.57	1951				
1948					January.....	1.55	1.83	2.54	2.88
January.....	1.70	(1)	(1)	3.50	February.....	1.63	1.90	2.48	3.18
February.....	1.94	(1)	(1)	3.54	March.....	1.71	1.60	2.19	2.89
March.....	1.68	(1)	(1)	3.38	April.....	1.30	1.53	2.21	2.79
April.....	1.58	(1)	(1)	3.14	May.....	1.08	1.45	2.09	2.67
May.....	1.26	(1)	(1)	2.93	June.....	1.21	1.38	1.93	2.71
June.....	1.18	(1)	(1)	2.83	July.....	1.17	1.45	1.97	2.68
July.....	1.24	(1)	(1)	2.75	August.....	1.15	1.46	1.94	2.86
August.....	1.35	(1)	(1)	2.63	September.....	1.01	1.52	1.99	2.93
September.....	1.28	(1)	(1)	2.47	October.....	1.12	1.49	1.85	2.97
October.....	1.35	(1)	(1)	2.38	November.....	1.23	1.49	1.81	3.05
November.....	1.22	(1)	(1)	2.32	December.....	1.28	1.25	1.56	2.99
December.....	1.32	(1)	(1)	2.13	1952				
1949					January.....	1.49	1.59	1.78	2.88
January.....	1.55	(1)	(1)	2.25	February.....	1.58	1.58	1.99	3.03
February.....	1.53	(1)	(1)	2.44	March.....	1.74	1.53	1.90	2.99
March.....	1.46	(1)	(1)	2.35	April.....	1.30	1.43	1.77	2.78
April.....	1.42	(1)	(1)	2.11	May.....	1.23	1.39	1.68	2.77
May.....	1.12	(1)	(1)	2.03	June.....	1.09	1.36	1.66	2.74
June.....	1.06	(1)	(1)	1.97	July.....	1.08	1.35	1.62	2.74
July.....	1.11	1.52	1.82	2.15	August.....	1.02	1.32	1.57	2.65
August.....	1.10	1.50	1.86	2.22	September.....	1.12	1.30	1.56	2.59
September.....	.96	1.41	1.82	2.16	October.....	1.17	1.28	1.53	2.54
October.....	1.11	1.49	1.91	2.27	November.....	1.15	1.23	1.59	2.54
November.....	1.13	1.50	1.90	2.34	December.....	1.26	1.12	1.45	2.67
December.....	1.15	1.46	1.63	2.36	1953				
1950					January.....	1.67	1.54	1.73	3.05
January.....	1.35	1.73	2.05	2.65	February.....	2.04	1.34	1.66	2.84
February.....	1.41	1.84	2.14	3.02	March.....	1.51	1.28	1.61	2.78
March.....	1.61	1.86	1.96	3.01	April.....	1.38	1.26	1.54	2.52
April.....	1.35	1.70	1.99	2.72	May.....	1.20	1.19	1.47	2.45
May.....	1.05	1.63	2.02	2.55	June.....	.91	1.17	1.42	2.27
June.....	.93	1.63	1.98	2.56	July.....	1.01	1.18	1.39	2.07
July.....	1.00	1.67	2.02	2.52	August.....	1.04	1.18	1.38	2.04

<sup>1</sup> Information not available.

SOURCE: References 1, 2, 4-6.

prevalence. The expected rate was derived by computing the mean monthly prevalence rates for the 12-year period July 1947–June 1959 as percentages of the grand prevalence rate for all months and all years, and applying these percentages to the mean rate for each year. The difference between the observed and the ex-

pected monthly prevalence rates might be considered the “excess monthly prevalence rate,” that is, the part of the rate not explainable by seasonal expectancies and trends in rates.

The effects of four previously noted influenza epidemics are apparently reflected in the labor force data: epidemics in March of 1950

**Prevalence of illness in the employed civilian labor force resulting in work loss of a week or more, and in the Armed Forces resulting in excuse from duty of a day or more, by month, July 1947–September 1959—Continued**

Month and year	Employed civilian labor force (percent)	Armed Forces			Month and year	Employed civilian labor force (percent)	Armed Forces		
		Air Force (percent)	Navy (percent)	Army (percent)			Air Force (percent)	Navy (percent)	Army (percent)
1953					1956				
September.....	1. 11	1. 16	1. 42	2. 01	October.....	1. 31	1. 02	1. 28	1. 40
October.....	1. 01	1. 22	1. 43	2. 09	November.....	1. 31	1. 02	1. 28	1. 44
November.....	1. 11	1. 14	1. 44	2. 11	December.....	1. 29	. 84	1. 15	1. 38
December.....	1. 15	. 98	1. 26	1. 94	1957				
1954					January.....	1. 40	. 96	1. 28	1. 43
January.....	1. 20	1. 27	1. 44	2. 05	February.....	1. 58	1. 05	1. 40	1. 77
February.....	1. 66	1. 23	1. 53	2. 11	March.....	1. 53	1. 06	1. 37	1. 75
March.....	1. 30	1. 18	1. 50	2. 07	April.....	1. 39	1. 03	1. 29	1. 61
April.....	1. 53	1. 19	1. 42	1. 98	May.....	1. 24	. 98	1. 25	1. 50
May.....	1. 32	1. 14	1. 33	1. 84	June.....	1. 18	. 97	1. 31	1. 43
June.....	1. 26	1. 02	1. 31	1. 75	July.....	1. 18	. 96	1. 37	1. 37
July.....	1. 14	1. 06	1. 27	1. 69	August.....	1. 33	1. 08	1. 32	1. 40
August.....	1. 08	1. 09	1. 28	1. 64	September.....	1. 30	1. 11	1. 38	1. 54
September.....	1. 04	1. 09	1. 27	1. 54	October.....	2. 03	1. 44	1. 70	1. 96
October.....	1. 05	1. 08	1. 30	1. 51	November.....	2. 06	1. 29	1. 49	1. 74
November.....	1. 09	1. 03	1. 29	1. 51	December.....	1. 54	1. 09	1. 29	1. 57
December.....	1. 08	. 92	1. 13	1. 51	1958				
1955					January.....	1. 84	. 98	1. 31	1. 50
January.....	1. 43	1. 30	1. 34	1. 66	February.....	1. 94	1. 17	1. 43	1. 79
February.....	1. 61	1. 22	1. 43	1. 88	March.....	1. 65	1. 20	1. 37	1. 78
March.....	1. 42	1. 17	1. 43	1. 77	April.....	1. 49	1. 07	1. 31	1. 59
April.....	1. 27	1. 12	1. 39	1. 72	May.....	1. 31	. 99	1. 26	1. 44
May.....	1. 17	1. 12	1. 35	1. 69	June.....	1. 16	. 96	1. 24	1. 31
June.....	1. 03	1. 04	1. 35	1. 67	July.....	1. 14	. 94	1. 25	1. 29
July.....	1. 09	1. 04	1. 35	1. 67	August.....	1. 13	. 96	1. 25	1. 35
August.....	1. 30	1. 01	1. 34	1. 60	September.....	1. 14	. 98	1. 28	1. 41
September.....	1. 30	1. 03	1. 33	1. 62	October.....	1. 26	. 98	1. 28	1. 46
October.....	1. 40	1. 04	1. 36	1. 61	November.....	1. 31	. 98	1. 26	1. 47
November.....	1. 36	1. 01	1. 36	1. 59	December.....	1. 25	. 90	1. 13	1. 40
December.....	1. 49	. 85	1. 21	1. 46	1959				
1956					January.....	1. 52	. 97	1. 16	1. 48
January.....	1. 64	1. 07	1. 29	1. 54	February.....	1. 61	1. 04	1. 27	1. 66
February.....	1. 65	1. 07	1. 37	1. 74	March.....	1. 70	1. 06	1. 26	1. 65
March.....	1. 57	1. 09	1. 34	1. 79	April.....	1. 57	1. 04	1. 22	1. 54
April.....	1. 43	1. 06	1. 32	1. 69	May.....	1. 39	. 96	1. 17	1. 46
May.....	1. 32	. 98	1. 28	1. 65	June.....	1. 15	. 94	1. 13	1. 40
June.....	1. 25	. 99	1. 25	1. 54	July.....	1. 30	. 92	1. 12	1. 31
July.....	1. 28	1. 00	1. 24	1. 50	August.....	1. 23	. 96	1. 17	1. 34
August.....	1. 33	1. 02	1. 24	1. 43	September.....	1. 27	. 95	1. 19	1. 35
September.....	1. 30	1. 04	1. 25	1. 41					

and 1951 and in February of 1953 (9), and the Asian influenza epidemic in October and November of 1957 (10). Some of the periods of excess prevalence of illness shown in figure 4 are apparently not associated with influenza epidemics. On the other hand, an epidemic in the spring of 1958, reported by Dauer (10), does not appear in figure 4. The failure of the 1958 epidemic to appear in the chart is due

largely to the inclusion of epidemic rates in the data from which expected rates were computed.

A refinement of the data shown in figure 4 is shown in figure 5. Here, the effects of the epidemics have been removed from the expected rates by substituting rates observed in the same month for the preceding nonepidemic year. For March 1950 and March 1951 the rate observed for March 1949 was substituted; for

February 1953 the rate observed for February 1952 was substituted; and for October 1957 through March 1958 the rates observed for October 1956 through March 1957 were substituted. In addition, for figure 5 the adjustment for trend was made quarterly rather than annually as in figure 4. This removes some cyclical movement apparently due to trends in the overall illness level. The method used in computing a normal seasonal curve for illness was essentially the one used by Collins and Lehmann in computing a normal seasonal curve for deaths from influenza and pneumonia (9). The base period for the illness data is the entire 12 years for which data were available.

Weekly excess mortality from influenza and pneumonia is also shown in figure 5. Data previously reported for the period July 1947 through June 1956 (9) have been carried through June 1959. The base period for July

1956 through June 1959 is the 5 years ending in August 1955.

The epidemic of Asian influenza in the spring of 1958 shows clearly in the labor force data plotted in figure 5, corresponding to an excess in mortality from influenza and pneumonia noted during that period. Generally, influenza epidemics, as measured by excess mortality from influenza and pneumonia, are reflected quite well in labor force illness data. There are, however, some periods of excess prevalence of illness which may be due to influenza but which are not associated with excess mortality. Both mortality and illness data suggest that the effects of influenza have increased since 1947.

Starting in 1954, the pattern of fluctuations in the prevalence of illness in the labor force survey series shown in figures 4 and 5 differs somewhat from the pattern for prior years,

**Figure 3. Percent of employed civilian labor force absent on an average workday because of illness as estimated from labor force survey data, and National Health Survey data, by quarter, July 1955–September 1959**

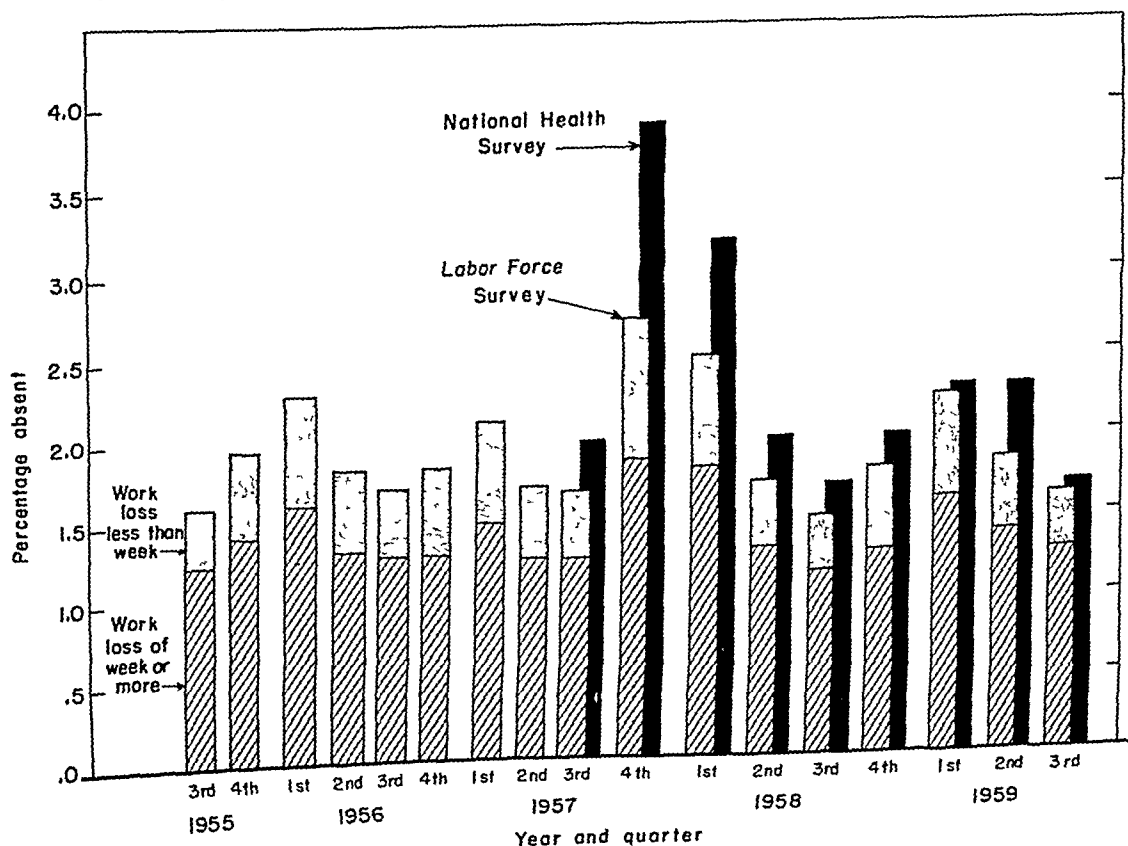


Figure 4. Monthly excess prevalence of illness in the employed civilian labor force resulting in work loss of a week or more, July 1947–June 1959

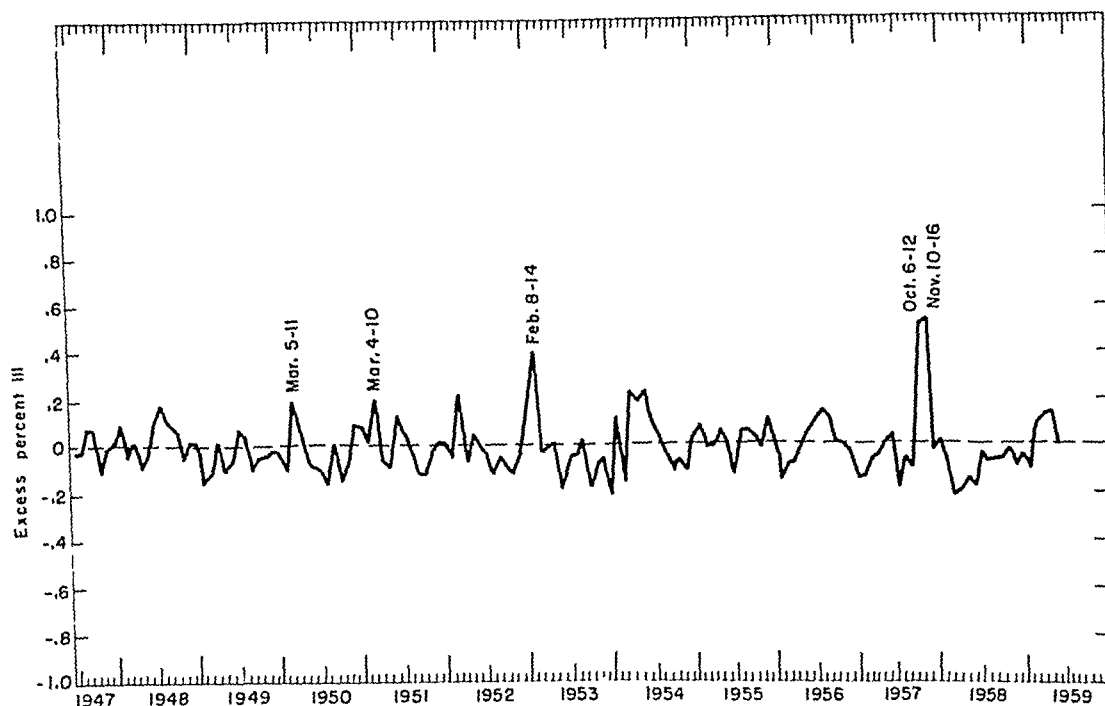
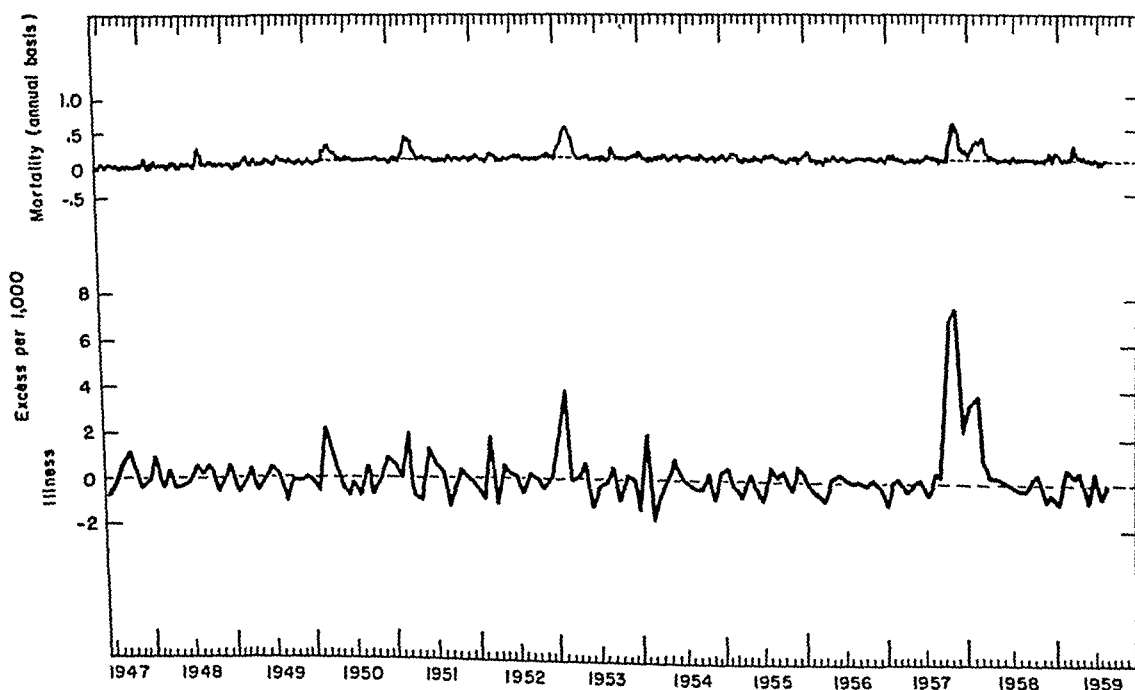


Figure 5. Monthly excess prevalence of illness in the employed civilian labor force resulting in work loss of a week or more (with influenza epidemics removed from expected rates), and weekly excess mortality from influenza and pneumonia in groups of cities in the United States



tending to move more systematically from one month to the next. This may be due to an expansion of the labor force sample from a 68-area sample to a 230-area sample in February 1954. Although the number of households interviewed each month did not change, the increase in the numbers of areas sampled, coupled with a substantially improved estimation procedure, increased the reliability of most of the major statistics by an amount equivalent to doubling the sample size ( $S$ ).

## Conclusion

For many purposes, the framework within which the presence of illness is established in the labor force survey would seem favorable to a fairly meaningful interpretation. For the series starting in July 1947, the type of illness dealt with is probably moderately severe, requiring the loss of a full week's work, or more, for persons otherwise economically active. It is not so severe, however, as to prevent employment. It is illness defined in a particular and possibly peculiar way.

The illness measured by the labor force survey apparently responds to many of the same factors as other measures of illness. Probably chief among these is influenza. In view of the large amount of data routinely accumulated by the monthly survey of the labor force and the general acceptance of its definitions of common occupational and economic variables, further examination of tabulated as well as untabulated materials would seem to be a valuable adjunct to other currently available measures of illness in the United States.

## Summary

Starting in July 1947, estimates have been published in "The Monthly Report on the Labor Force" showing the total employed persons in the civilian labor force 14 years of age and over, and the number of these persons who did not work at all the week preceding a monthly interview because they were ill.

During the period July 1947 through September 1959, the percentages of ill persons ranged between 1 and 2 percent. No overall trends are apparent.

Fluctuations in these illness rates generally conform to fluctuations observed in illness rates for the Armed Forces; seasonal variations conform to those observed in illness surveys of civilian populations and to seasonal variations in Armed Forces data.

Influenza epidemics noted in studies of mortality are clearly shown in the labor force series.

Generally, information on illness reported in "The Monthly Report on the Labor Force" would seem to be a valuable supplement to other data regarding illness patterns and trends in the United States.

## TECHNICAL NOTE

### Definitions

*Employed civilian labor force.* "The Monthly Report on the Labor Force" includes in the employed civilian labor force all civilians who, during a specified week: (a) did any work at all as paid employees or in their own businesses or professions, or on their own farms, or worked 15 hours or more as unpaid workers on a farm or in a business operated by a member of their families; or (b) were not working or looking for work but had jobs or businesses from which they were temporarily absent because of illness, bad weather, vacation, or labor-management dispute, or because they were taking time off for various other reasons.

The National Health Survey identifies the civilian population "usually working." This population, while similar, is not identical to the employed civilian labor force as defined in "The Monthly Report on the Labor Force."

*Illness.* As used here, and as the concept of illness applies to the working population, illness data are intended to include all persons not working because of medical reasons, including sickness, injuries, or ill effects from earlier accidents or injuries. This concept is implied in data published in "The Monthly Report on the Labor Force" and specified in data published for the Armed Forces and by the National Health Survey.

### Measurement of Illness

*Labor force survey.* Illness lasting an entire work-week is identified for each person 14 years of age and over from the following series of questions:

"Did \_\_\_\_\_ do any work at all last week, not counting work around the house?" If "No":

"Was \_\_\_\_\_ looking for work?" If "No":

"Even though \_\_\_\_\_ did not work last week, does he have a job or business?" If "Yes":

"Why was he absent from work last week?"

Answers to the last question fall mainly into four categories: own illness, on vacation, bad weather, and

labor dispute. The illness prevalence rate for a single month is the proportion of the enumerated employed civilian labor force who reported that they did no work during the entire week preceding the enumeration because of own illness.

Illness lasting less than a workweek is identified for each employed person 14 years of age and over who worked less than 35 hours the week prior to the interview, from the following series of questions:

"Does \_\_\_\_\_ usually work 35 hours or more a week at this job?" If "Yes":

"What is the reason \_\_\_\_\_ worked less than 35 hours last week?"

One category of response to the last question is "own illness." In order to derive the prevalence rates shown in figure 3, it was necessary to estimate the average number of days of absence for persons absent less than 1 workweek. This was estimated at 2.54 days, based on a study by Gafafer and Frasier (11). Workdays were estimated as 260 per person per year.

Each month's illness figures represent a single week's experience for the employed civilian labor force. Prior to July 1955, published figures were for the calendar week containing the eighth day of the month. In July 1955, this was changed to the calendar week containing the 12th day of the month.

**Armed Forces.** In the Armed Forces, illness is identified from reports on persons not available for duty for medical reasons. The Air Force includes in the illness category persons under treatment as inpatients, in quarters, on sick leave, or AWOL from a patient status for 10 days or less. The Army includes excused-from-duty patients in hospitals and quarters in all medical-treatment facilities. The illness prevalence rate for a single month is the proportion of the available man-days lost because of illness, that is, the average daily proportion of the average total manpower unavailable for duty because of illness. This prevalence rate is usually referred to as the noneffective rate or ratio and is a principal measure of manpower loss due to medical causes or injury used by the Armed Forces.

Data for the Air Force and Navy are worldwide. Data for the Army are for the continental United States only, but include evacuees. Air Force data are for all medical causes while Navy and Army data exclude battle injuries.

**National Health Survey.** In the National Health Survey, illness is identified for the "usually working" population 17 years of age and over by first attempting to identify for the 2-week period preceding the interview sickness, accidents or injuries, ill effects from earlier accidents or injuries, and medicine or treatment taken. Also, an attempt is made to identify the presence of "ailments or conditions that have continued for a long time" and a "yes" or "no" response is obtained to a checklist of 35 chronic conditions and impairments. If any illness (disease, impairment, accident, etc.) is identified in any of these screening questions and it is established that the illness caused the individual to cut down on his usual activities for

as much as a day, the question is asked: "Last week or the week before, would you have been working at a job or business except for (the condition named)? How many days [during last week or the week before] did (the condition named) keep you from work?"

The illness prevalence rate for any period of time is the proportion of available man workdays lost because of illness. In this report, available man workdays were estimated as 260 per person per year.

#### Standard Error of Labor Force Estimates

The estimates of the prevalence of illness in the civilian employed labor force are based upon a sample and may differ somewhat from figures which would have been obtained if a complete census had been taken. The following table gives a rough idea of the order of magnitude of the standard error of the estimated prevalence rates shown for each month, beginning in February 1954. The chances are about 68 out of 100 that an estimate for a single month would differ from a complete census by less than the standard error.

Standard error of labor force illness prevalence rates

Percentage ill	Standard error of estimate	
	February 1954-April 1956	May 1956-September 1959
0.5-----	0.053	0.042
1.0-----	.074	.059
1.5-----	.092	.073
2.0-----	.104	.082
2.5-----	.114	.091

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# Program Notes

## *The Personal Touch*

Enlistment of the cooperation of physicians in many public health programs is frequently difficult. This is not in any sense due to their perversity or lack of interest, but is related more to lack of emphasis on public health teaching when many physicians attended medical school.

The need for physician cooperation became evident in the tuberculosis control program of the Boston Health Department. Here it was a question of alerting physicians in high incidence areas to the frequency of diagnoses of tuberculosis in their areas, and emphasizing the services available to them in the Boston Health Department for the diagnosis, treatment, and followup of cases. The health department had sent letters giving physicians this information, but it was impossible to evaluate their effectiveness. It was thought advisable to extend this educational program.

Personal interviewing of the physicians of Boston to call to their attention the public health aspects of tuberculosis control was the course selected. Greatest emphasis is placed on contacts with physicians who practice in areas where tuberculosis incidence is highest, with efforts in the areas of lesser incidence determined by personnel time available for the program. Two health educators from the department and two from the Boston Tuberculosis Association were made available.

Information concerning tuberculosis control presented to the physicians at pre-arranged visits to their offices include:

- Statistics on the incidence of tuberculosis in Boston in general and in the specific area of practice.

- Schedules giving the times and locations where X-ray, laboratory, and consultation services are available in the health department for private patients, stressing that the results of these examinations are reported only to the referring physician who retains the private care of the patient.

- Literature on the use of the Mantoux tuberculin test, its interpretation, and a detailed description of its technique, with a supply of 1:2,000 solution of O.T. provided on request.

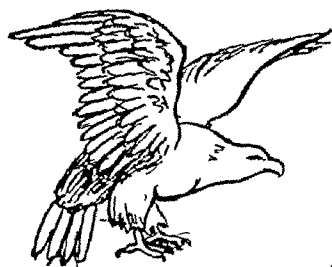
- Detailed information on the rehabilitation services available to private patients.

They are given stickers to attach to prescription blanks authorizing 14" x 17" chest X-rays of patients, the findings reportable only to the prescribing physician, and bottles for use in sending specimens of sputum of patients to the department for analysis for tubercle bacilli by smear or culture. They are also informed that sensitivity testing is available upon request.

Questions are answered and physicians are asked for any suggestions or criticisms, either on health department practices in general or the tuberculosis program in particular.

The interviewers have been very well received. Of 111 physicians visited, only 2 were not interested and only 1 showed annoyance. Double postcards for followup of these interviews were returned by 50 percent of the physicians visited. Of the physicians who returned postcards, over 95 percent were enthusiastic and stated that they would like additional visits at intervals of about a year.—GEORGE KAHN, M.D., M.P.H., chief, bureau of disease control, Boston Health Department.

# United States-Mexico Border



## Public Health Association



### CONFERENCE REPORT

A model international medium for the reciprocal flow of ideas, cooperative planning, and the fusion of energy and resources for greater positive health, the United States-Mexico Border Public Health Association held its 18th annual meeting April 4-8, 1960, at Hermosillo in the State of Sonora, Mexico.

The more than 300 delegates, primarily public health officials from both countries, included a roster of distinguished participants headed by Dr. José Alvarez Amézquita, Mexican Minister of Health and Welfare, the Honorable Robert C. Hill, United States Ambassador to Mexico, Dr. Leroy E. Burney, Surgeon General of the Public Health Service, Don Alvaro Obregón, Governor of Sonora, and Dr. Abraham Horwitz, director of the Pan American Sanitary Bureau, WHO Regional Office for the Americas.

#### **Progress in Malaria Eradication**

The opening presentation reviewed the malaria eradication campaign in Mexico, now terminating the total coverage phase of spraying all domiciles. Studies in 1956 following plans begun a year before, delineated as malarious 58

percent of Mexico's geographic area. In each of the subsequent 3 years, more than 3 million domiciles were protected with two treatments of DDT or one of dieldrin by spraying teams brought by truck, horseback, or boat.

By 1959, malaria death rates in Mexico had fallen from 90, the annual average for the disease during 1949-53, to less than 10 per 100,000 population. Reported malaria morbidity has dropped by 98 percent since 1950. For the coming 3 years, the timetable calls for surveillance to eliminate the residual foci of malaria.

A unique feature of the campaign is the appointment of honorary health aides—community leaders who have been effectively helping to broaden health education locally.

#### **Quarantine Activities**

In a panel discussion of the quarantine activities of the Public Health Service along the Mexican border, it was pointed out that the process of screening Mexican nationals entering the United States has value for both nations. Some of the cases of communicable diseases found are treatable during the examination period, and others, with the active sup-



port of Mexican health officials, can be cared for in Mexico.

### Nurse Recruitment

The growing need for nurses in the face of a chronic shortage of such personnel in Mexico was underlined in a report on nurse recruitment. Among the means advocated for overcoming prejudices and misinformation about nursing among potential candidates was early instruction of young women in the advantages of the career, such as promotion opportunities, prerequisites for entering the profession, and fields of specialization.

### Environmental Health

*Discussions in the environmental sanitation* section of the meeting centered on advances in Mexico in the development of potable water systems within the State of Sonora and in Ciudad Acuña, Coahuila. Cited among the factors generating these and other environmental sanitation activities in Sonora was the recent rapid economic and population growth, while accelerated action for water supply development was stimulated by high morbidity and mortality rates related to waterborne diseases. Named as chief inhibitors of the undertaking were the climate, low economic level of the farming sector, and dispersed population.

Progress in environmental sanitation was also reported for Nuevo León, in which a broad and coordinated health education drive is being stressed, and for Reynosa, Tamaulipas, whose population has doubled since 1950. The water supply network, water treatment stations, the sewerage system, slaughterhouses, and street paving in Reynosa were described in detail.

In the field of occupational health, a review was presented on the New Mexico program directed to small industry.

The fact that 14 of the 16 schools of civil engineering in Mexico now offer courses in sanitary engineering was brought out in an account of Mexican efforts to improve instruction of preventive medicine and public health in professional schools. Also reported were broadened opportunities there for environmental health workers to obtain formal training.

Of global interest was the vigorous recommendation that international health organizations focus efforts on a world water supply program, for which the public health need was described as strong.

### Control of Venereal Diseases

Coverage of venereal disease control highlighted three points: infectious venereal disease continues to be a serious challenge; case-finding techniques need improving, especially in regard to communications in a bilingual area such as the border; and the proliferation of diagnostic tests is sometimes a source of confusion to the practicing physician. It was pointed out, however, that the new tests have enhanced specificity.

The rapid plasma reagin test excels in accuracy, simplicity, and economy, allowing for prompt diagnosis and thus eliminating the need for followup to find reactors. It is of major value with mobile groups.

Another development has been the identification of gonorrhea in the male with the direct fluorescent antibody procedure. Although testing in the female requires a delayed procedure because of insufficient organisms for immediate detection, results are still obtainable more quickly than with the culture technique.

Four avenues of approach to casefinding were reviewed:

- Twin city control boards assuring for the binational metropolitan areas that all health resources are coordinated toward a unified program. First developed in El Paso-Ciudad Juárez, this approach is now being extended to other twin cities of the border.
- Continuation of the testing and referral program for the agricultural contract laborers.
- Further improvement of contact interviewing.
- Broadening the application of public information methods developed for venereal disease casefinding in the border area.

### Trachoma

Described as an important disease on Indian reservations in southwestern United States and in parts of Mexico such as Nuevo León, Tamaul-

lipas, and Sonora, trachoma was highlighted by the association in an exhibit with Spanish and English texts and illustrations of control activities showing details of the current project for diagnosis, treatment, and followup in every reservation where trachoma is found. Five more years of intensive programing followed by years of surveillance, are planned.

The eye disease in Mexico was described as characteristically appearing in the acute stage in children and in the intermediate or late stage in adults. In a study of agricultural contract laborers, only 14 of 334 with evidence of trachoma were in the active stage; the rest were in the healed phase. Among Indians with the disease in the United States, blindness occurs in about 1.5 percent. Their active cases are treated with acromycin drops and triple sulfonamides for 3 weeks, or for 6 weeks if the sulfonamides alone are used.

Good results were reported by Sonora health authorities from treating school children and others possibly affected, on the basis of sulfonamides and tetracycline in eye drops and ointments over a period of 2 or 3 months.

#### Diarrheal Diseases and Nutrition

Control of diarrheal disease was the topic of panel talks devoted to its broad aspects and of roundtable discussions on the disease in the border area. Centering on accounts of local operations in the United States and in Mexico, the participants developed the concept that effective, acceptable projects can be carried out with local resources in the absence of adequate laboratory services.

The correlation between sanitation and low rates of diarrhea points to the need for delineating areas with sanitation deficiencies as targets for control efforts.

Cognizance was also given to the need for adequate symptomatic treatment of acute cases and for instructing mothers to recognize early signs of dehydration. The value of rehydration centers in local health services for the prevention of diarrhea deaths was underscored.

Another presentation described the Yaqui Indian tribe in Sonora in relation to individual and collective health status. Their poverty, primitive economy, use of two languages, at-

tachment to ancestral routine, and geographic location, among other factors, illustrate the complexity of the task of incorporating them into modern life with all the advances in health.

An approach to human nutrition by increasing its adequacy through control of animal disease was emphasized in the veterinary public health section of the meeting. Members recommended that the section's future programs contain more reports devoted to animal diseases affecting the availability of meat.

#### The Rabies Hazard

The numerous reservoirs of rabies, such as skunks, foxes, coyotes, and bats, along the Mexican border were cited by association members as constituting a real disease hazard. A recent outbreak of rabies in the Imperial Valley-Mexicali area uncovered several hundred rabid dogs and resulted in treatment of at least 400 persons and destruction or vaccination of many thousands of dogs.

Other discussion highlights were that rabies has existed in California in dogs and men since the 1830's and was found in spotted skunks in the 1870's. The past 20 years saw a marked decline in rabies incidence in the United States, largely from the dramatic drop in cases among dogs. Laboratory-confirmed cases among dogs have fallen by 90 percent in the last 50 years. Rabies in wildlife, however, has been rising. The north central area of California has been involved in a rabies epidemic, primarily in the large striped skunk, *Melephitis melephitis*. Probably adding to the rabies hazard are insectivorous bats of the southwestern States. As long as rabies continues in wildlife, eradication is not foreseeable, but public health steps should include mass immunization of dogs and maintenance both of this immunity and of stray dog control. Dissemination of health information is vital, primarily for better handling of bite cases.

The bat rabies picture is still undefined. In the commonest bat species, the infection rate approximates 15 percent. Although there are no known cases of natural transmission to animals, five human rabies deaths in the Nation were associated with exposure to bats, one indisputably with bat transmission.

## Tuberculosis and Poliomyelitis

The meeting's coverage of tuberculosis included a presentation of plans for national control of the disease in the United States, in terms of past progress and the opportunity during this decade of reaching the campaign's ultimate stage—that of eradication.

A brief epidemiological review of poliomyelitis in Mexico during 1955-59 indicated occurrence by age, sex, geographic location, socioeconomic level, virus type, and trend. In addition to outlining the 1960 prevention drive, prevention measures, based on the Salk vaccine, gamma globulin, and live virus vaccines, were set forth.

### U.S.-Mexico Field Study

A scientific high point of the meeting was an account of a general ecologic survey for arthropod-borne viruses in the Hermosillo area of

Mexico. An impressive demonstration of effective cooperation between scientists of the two countries, the project had more than a score of scientists, from all levels of government and from universities and foundations, who finished the fieldwork in early April 1960. Specimens collected in the survey included 11 species of mosquitoes, 124 domestic animals, and some 250 rodents.

Such a study in plateau desert-type terrain gives a broader view of wildlife infection reservoirs that may lead to measures preventing the spread of the infection to other hosts, in this case, the spread of encephalitis to horses and man.

Encephalitis causes a substantial number of human deaths in Mexico, accounting for several hundred recorded cases in 1953-59, as well as of equine fatalities numbering as high as several thousand.

## Annual Report in Newspaper Style

Residents of Cattaraugus County, N.Y., received recently an eight-page newspaper devoted wholly to reporting the accomplishments of the Cattaraugus County Health Department during the years 1958-59. The report was delivered by carriers of the 2 daily and 8 weekly newspapers to 37,000 subscribers, almost one-half the population of the county, at less than 5 cents a copy gross cost.

The idea of an annual report in newspaper style was employed by the health department chief in the belief that residents of the county would be more attracted by this form of information about the health services supplied and paid for by their tax dollars. The published report is preserved by some of its readers as a reference.

In planning the project, Dr. Ian D. McLaren, commissioner of health, invited local newspapers to bid on printing the report, with

the stipulation that the health department would supply all photographs, charts, and drafts of the text. The *Olean Times Herald* was the successful bidder.

After the written material was edited by a *Times Herald* staff member, the layout was completed in a 10-hour Sunday session by Dr. McLaren and James V. Bronold, business manager of the newspaper.

Each department head checked galley proof of copy covering his jurisdiction. Activities in administration, public health nursing, rehabilitation, mental health, sanitation, and laboratory techniques were reported and illustrated with photographs and charts.

The report was addressed to members of the Cattaraugus County Board of Supervisors. Through the New York State Department of Health, copies were sent also to State senators and assemblymen.

# Progress in Reporting Mental Hospital Statistics

*Tenth Annual Conference of  
Mental Hospital Statisticians  
Bethesda, Md., May 17-19, 1960*

THE ANALYSIS of mental hospital patient movement in relation to drug therapy, the evaluation of community mental health programs, and a study of rehospitalization among cohorts of patients released from mental hospitals were among the topics discussed at the Tenth Annual Conference of Mental Hospital Statisticians.

The conference, held in Bethesda, Md., May 17-19, 1960, is sponsored annually by the National Institute of Mental Health, Public Health Service.

Delegates from each of the 22 member States of the Model Reporting Area for Mental Hospital Statistics attended (see box insert). Observers from Georgia, Idaho, Iowa, Maryland, Mississippi, Oregon, and West Virginia were also present, as well as representatives from the Dominion of Canada, Veterans Administration, American Psychiatric Association, Western Interstate Commission for Higher Education, and Southern Regional Education Board.

## **Drug Therapy and Patient Movement**

Since the advent of the widespread use of tranquilizing drugs in State mental hospitals in late 1954 and in 1955, many controlled studies have been conducted to determine the efficacy of various compounds in the treatment of psychiatric patients. Such studies have been carried out on small samples of patients and have been oriented toward determining the effect of

a psychoactive drug in relation to that of a placebo on certain specified symptoms.

As a means of supplementing the knowledge gained from these studies the Biometrics Branch and the Psychopharmacology Service Center of the National Institute of Mental Health have a joint interest in determining the effect of drug usage on the movement of mental hospital populations. The questions toward which such studies would be directed are as follows:

1. What are the characteristics of patients who receive drugs compared with those who do not?
2. What is the prehospital drug history of patients?
3. What drugs do patients receive and in what dosage?
4. What is the interval between admission to the hospital and initiation of drug therapy? between the beginning and termination of drug therapy? Is therapy continuous or intermittent?
5. How are the above factors related to patient movement both within the hospital and between the hospital and the community?

It is realized that a difference in outcome between a group of patients who received drugs and a group who did not cannot be attributed to the effect of drugs alone, since there are many factors which determine the selection of patients for drug therapy. However, by examining these differences much can be learned about the experience of patients who did receive

drugs. Also, considerable knowledge can be gained about the selection of patients for drug therapy by comparing their distributions by age, sex, diagnosis, and length of hospital stay with those of patients not placed on drug therapy.

A discussion of current procedures for recording drug therapy information in State mental hospitals revealed that in most States it is not possible at the present time to answer the questions posed above. It was suggested that studies be developed in one or more State mental hospitals to test methodology and to develop recordkeeping procedures which would permit systematic analysis of patient movement in relation to drug therapy. It was further proposed that State mental hospital systems be encouraged to apply for grants to conduct such studies.

### Community Mental Health Programs

A discussion was devoted to the effect of the availability and use of various types of community facilities for the mentally ill upon the number and characteristics of patients admitted to State mental hospitals. The importance of obtaining adequate data on patients coming under care in such facilities as general hospitals, community clinics, day care and night care centers, nursing homes, and homes for the aged was emphasized. Due to the increased use of such facilities it has become more difficult to evaluate the effectiveness of State mental hospitals without taking into account the relationship between these hospitals and all of the other facilities in the community which care for the mentally ill. Only a few States are beginning to collect information on patients coming under care in certain of these facilities.

To obtain data on a more comprehensive basis, case registers are now being developed whereby basic information, such as name, address, age, sex, marital status, and diagnosis, is submitted to a central agency for every patient admitted to inpatient and outpatient psychiatric facilities in a defined geographic area. One of these registers also includes reports from the private psychiatrists. Data collected in this way will make it possible to obtain unduplicated counts of individuals by various characteristics, to determine the rates

### Model Reporting Area States

Representatives from the following States are members of the Model Reporting Area for Mental Hospital Statistics:

Arkansas	Michigan	Pennsylvania
California	Minnesota	Tennessee
Connecticut	Nebraska	Texas
Illinois	New Jersey	Virginia
Indiana	New York	Washington
Kansas	North Carolina	Wisconsin
Kentucky	Ohio	
Louisiana	Oklahoma	

of flow of persons from one facility to another, to study changes in diagnosis from one agency to another, and to provide numerator data for determining the proportion of the population under treatment at a given point in time.

It was agreed that at future meetings more intensive consideration should be given to the evaluation of mental hospital programs within the framework of the other psychiatric treatment programs operating in the community served by the hospital, as well as to the evaluation of these treatment programs themselves.

### Cohort Study

A presentation was made of preliminary findings of a study of the experience of patients placed on convalescent leave by the New York State mental hospital system. In this study, each patient who had been placed on convalescent care during 1955, 1956, and 1957 was classified by age, diagnosis, length of time in the hospital prior to placement on convalescent care, and status at various intervals after such placement. He was also classified as to whether he was in the hospital, discharged, or still on convalescent care.

Of the total cohort, approximately 17 percent were in the hospital 1 year after release, and this percentage did not change appreciably within the next 2 years. However, one-quarter of all patients placed in convalescent care had one or more returns to the hospital during the first year, one-third had one or more returns during the first 2 years, and approximately 40 percent during the first 3 years. Among diag-

nostic groups or among age groups, there was no appreciable variation in the proportion in the hospital at specified intervals after placement, but there was distinct variation according to length of time in the hospital prior to placement. For example, among those who had been hospitalized less than 3 months, 10 percent were in the hospital 12 months after placement on convalescent care, compared with 26 percent among those who had been hospitalized 19 months or more prior to placement on convalescent care.

The above study illustrates one method of analysis which will be employed in the cohort study now underway in 20 of the Model Reporting Area States. Collection of data for this study began in 1959 and will continue through 1963. The study will determine not only the hospitalization status of patients at specified intervals of time after release, but will also determine the probability of their staying in the community and of rehospitalization for specific intervals of time after release.

### Personnel

Data on mental hospital personnel collected annually by the National Institute of Mental Health and published in "Patients in Mental Institutions" have been considered to be of only limited utility. These data consist of the number of personnel in each State mental hospital system employed in certain specific occupational categories. The members present at the Ninth Annual Conference of Mental Hospital Statisticians in the Model Reporting Area recommended that the Biometrics Branch of the National Institute of Mental Health organize a committee to discuss the problem of collecting adequate data on mental hospital personnel on a national scale. Such a committee, consisting of statisticians, personnel officers, and administrators from several States, met in March 1960, and the report of the meeting was presented at this conference.

There was general agreement among the members of the committee that the inadequacy of currently available data on mental hospital personnel can be classified into two categories: (a) the present classification of personnel is inadequate and ill-defined, and (b) the ratios of

specific categories of personnel to the total resident population of the hospital or a State mental hospital system are inadequate to show the staffing of mental hospitals.

The committee agreed in principle that it would address itself only to those problems relating to the national reporting of personnel data. From the discussion it appeared that the most frequent users of personnel data are the mental hospital administrators, for whom the data had two major purposes: (a) administrative, to indicate the need for additional personnel and to use in the presentation of budget material to the legislature; and (b) program evaluation, to compare staffing patterns among hospitals and among State systems in relation to measures of patient movement.

The committee chose as its major task the development of a first draft of a revised personnel classification. In so doing the members agreed that only those categories of most interest to the users of the data should be listed specifically and that those remaining be placed in an "all other" category. It was also agreed that part-time personnel should be classified according to the number of equivalent full-time positions they occupied. It was decided that since certain personnel performed several functions in some hospitals it would be more useful to classify personnel according to major function. For example, medical directors and assistant superintendents who are also psychiatrists would be classified as psychiatrists rather than under the former categories. Each category of personnel would then be subdivided according to professional and special training qualifications.

Considerable interest was expressed by the committee in the routine reporting of data on personnel turnover. It was suggested that for each category of personnel the following items be reported: number employed at beginning of year, number added during the year, number leaving employment during the year, and number employed at end of year. A personnel turnover ratio could then be computed by dividing the number of personnel leaving employment during the year by the average number employed during the year.

The conference participants agreed that the work of the committee represented a meaning-

ful start in the revision of the personnel reporting form. Some doubt was expressed, however, as to whether existing personnel records in some State mental hospital systems would permit the tabulation of personnel in the proposed categories. The group supported a recommendation of the committee, namely, that the Biometrics Branch develop specific definitions for each category in consultation with experts in the field, and that these definitions then be distributed among the States for comments and suggestions.

### Other Problems

A brief report was presented of the developments of the study being conducted jointly by the National Institute of Mental Health and the mental health authorities in two States to determine the socioeconomic and family characteristics of patients admitted to all psychiatric facilities serving residents of these States and to compare these characteristics with those of the general population of these States as enumerated in the 1960 census. The facilities included are public mental hospitals, private mental hospitals, Veterans Administration hospitals, general hospitals with psychiatric facilities, and outpatient psychiatric clinics. The main objective of the study is to determine the extent to which population groups with different characteristics use the various types of psychiatric facilities.

This study is aimed at considerably enlarging present knowledge about the rates at which patients from different population groups come under care of psychiatric facilities. Heretofore, most of the investigations of this type have involved only patients admitted to public mental hospitals and have dealt only with a limited number of patient characteristics which could be related to the published U.S. census data on population characteristics, such as age, sex, color, marital status, and urban-rural residence. In contrast, the present study will encompass patients admitted to all types of psychiatric facilities and will include data on the patient's family, such as family composition, family size, patient's relationship to family head, and the characteristics of the family head, as well as other characteristics of the patient.

These detailed data will be obtained directly from the 1960 U.S. census schedules. To accomplish this the hospitals and clinics will furnish the following information on each patient admitted during the period June 1, 1960, to May 30, 1961: name, age, sex, race, and address at time of admission, as well as address and name of head of household in which the patient resided at the time of the U.S. census on April 1, 1960. This information will enable the Bureau of the Census to locate the appropriate census schedules in their files. Demographic and socioeconomic data on patients and their families will be transcribed from the census schedules and tabulated. A special arrangement with the Bureau of the Census to provide the study group with unpublished tabulations on the detailed family characteristics of individuals in the general population will permit, for the first time, computation of rates according to these characteristics.

A more limited aspect of this study is underway in two additional States where only patients admitted to public mental hospitals are being studied. The socioeconomic and family data for these patients are being obtained by a direct interview of each patient or his respondent rather than from the 1960 census schedules. Aside from providing data on segments of the population admitted to the public mental hospitals, this study will also provide a good test of the feasibility of obtaining fairly comprehensive data on mental patients by the interview method.

Since the majority of those present at the conference are responsible for collecting and analyzing data on outpatient psychiatric clinics, a workshop was devoted to that topic. The following needs were expressed with reference to data collected from these facilities on a national basis:

1. Further standardization of recording and reporting patient data and clarification of some of the definitions.
2. Classification of outpatient clinics to provide national tabulations for comparable facilities.
3. Data on additional aspects of clinic activities which would permit the evaluation of the role of these facilities in the overall mental health program.

The group agreed that the Biometrics Branch should continue to meet with State and regional representatives in an attempt to achieve these objectives. They suggested that, in reevaluating existing procedures for reporting on patients served, special emphasis be given to the following problem areas:

1. Diagnostic categories for special groups, such as children.
2. Psychiatric description by professional personnel other than a psychiatrist.
3. Procedures for categorizing the problems or symptoms which lead to clinical referrals and for relating these to diagnosis or description.
4. Procedures for reporting patients not under active treatment.

#### **Regional Meetings**

The Fifth Midwest Conference on Mental Health Statistics was held in St. Paul, Minn., on October 8 and 9, 1959. The major topic was a proposed project on factors affecting admission of aged patients to the State mental hospitals. After considerable work by a committee it was decided that the study would be conducted in two phases. The first will be a cohort study of patients 65 years of age and over admitted to the State mental hospitals, in which certain characteristics and background data on these patients will be related to probabilities of their release from or death in the hospital during specified periods of time subsequent to admission. This phase of the study, in which approximately seven States will participate, will be based on data usually obtained as part of the routine admission procedures of the hospitals.

The second phase of the study will involve collection and analysis of more complex data. Among the factors to be considered are the socioeconomic characteristics and living arrangements of aged patients admitted to mental hospitals, the kinds of care they require, and the kinds of care the hospitals are able to provide. It is likely that each of the two or three States which will participate in this phase will study a single aspect of the problem and, through correspondence and contacts, attempt to coordinate their efforts in such a way that results from one aspect of the study will be useful in interpreting those from another.

As a result of an interest in program evaluation expressed by the directors of the mental health programs in the 16 States served by the Southern Regional Education Board, the first annual meeting of the Southern Regional Conference on Mental Health Statistics was held in Atlanta, Ga., on January 26-28, 1960. This meeting was attended by persons representing the statistical reporting programs of the mental health department in each of the 16 States. Objectives of the group were formulated as follows:

1. To work toward gaining comparability in mental health statistical data and uniformity in reporting these data based on standard definitions already developed by members of the Model Reporting Area, with a goal of all States in the region becoming members of the Model Reporting Area.

2. To facilitate interchange of comparable statistical data among the States in the southern region.

3. To provide a medium for the exchange of ideas and papers on research and methodology.

4. To foster cooperation in the design and preparation of studies of significant mental health problems.

5. To encourage better communication between the statistician and the mental health administrator and between the statistician and the clinician to accomplish the best use of statistical data for program planning, administration and evaluation, clinical research, and presentation to the general public.

It is planned that this group should meet annually and that it should ultimately develop a series of cooperative research projects of special interest to the mental health program in that region.

#### **Reevaluation of Model Reporting Area**

During the course of the first 10 meetings of the Model Reporting Area for Mental Health Statistics a substantial proportion of the time has been devoted to the development of uniform definitions of terms describing patient movement and to the production of uniform tabulations. Considerable progress has been made in this direction. Since its inception, the Model Reporting Area membership has grown from 11 to 22 States and it is expected that



several additional States will become members within a short time. Each of the member States has adopted the uniform definitions which have been developed and refined over the years.

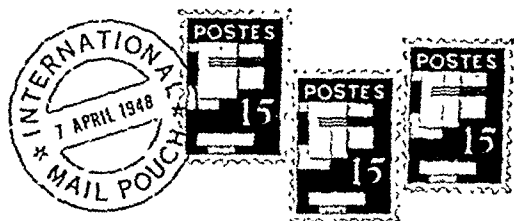
In view of the increased membership and the repeated recurrence of certain problems related to definitions, a committee on definitions was appointed to be responsible for receiving and making recommendations on problems of implementation or revision of the definitions now in use and in the development of new definitions in areas where none exist. A committee on program planning was appointed to determine ways in which more effective use can be made of the annual meetings. It was the general consensus of the group that more time should be devoted to individual workshops which would be oriented

toward the development of tools for the evaluation of mental hospital programs.

Examples of problems to be considered by the program planning committee are as follows:

1. Methods of analyzing the movement of patients in relation to the use of specific types of therapy.
2. Methods of relating patient movement data for State mental hospitals to the use of other facilities for the mentally ill in the community.
3. A study of the role of the mental hospital in the care of aged persons who become mentally ill.

The committee will select problems of crucial importance to State mental hospital programs and will suggest methods by which the Model Reporting Area can approach these problems most effectively.



## *The Devil in the Valley*

In the rich farming region of Haiti's Artibonite Valley is the Albert Schweitzer Memorial Hospital, supported and operated by a U.S. foundation. The hospital provides medical care of a quality equal to that in good hospitals in the United States, but its facilities are swamped with patients with preventable diseases and its administrators would like a preventive medical program in the valley.

Early in 1960, 37 babies were hospitalized with tetanus of the newborn, and the hospital's records show an increase in the number of cases in the previous year. At the request of the hospital's nursing director, a nurse of the Inter-American Cooperative Public Health Service (SCISP) conducted an informal survey of the incidence of tetanus of the newborn in the area.

Accurate statistics on the Artibonite Valley do not exist, but the nurse talked with 200 mothers. Of

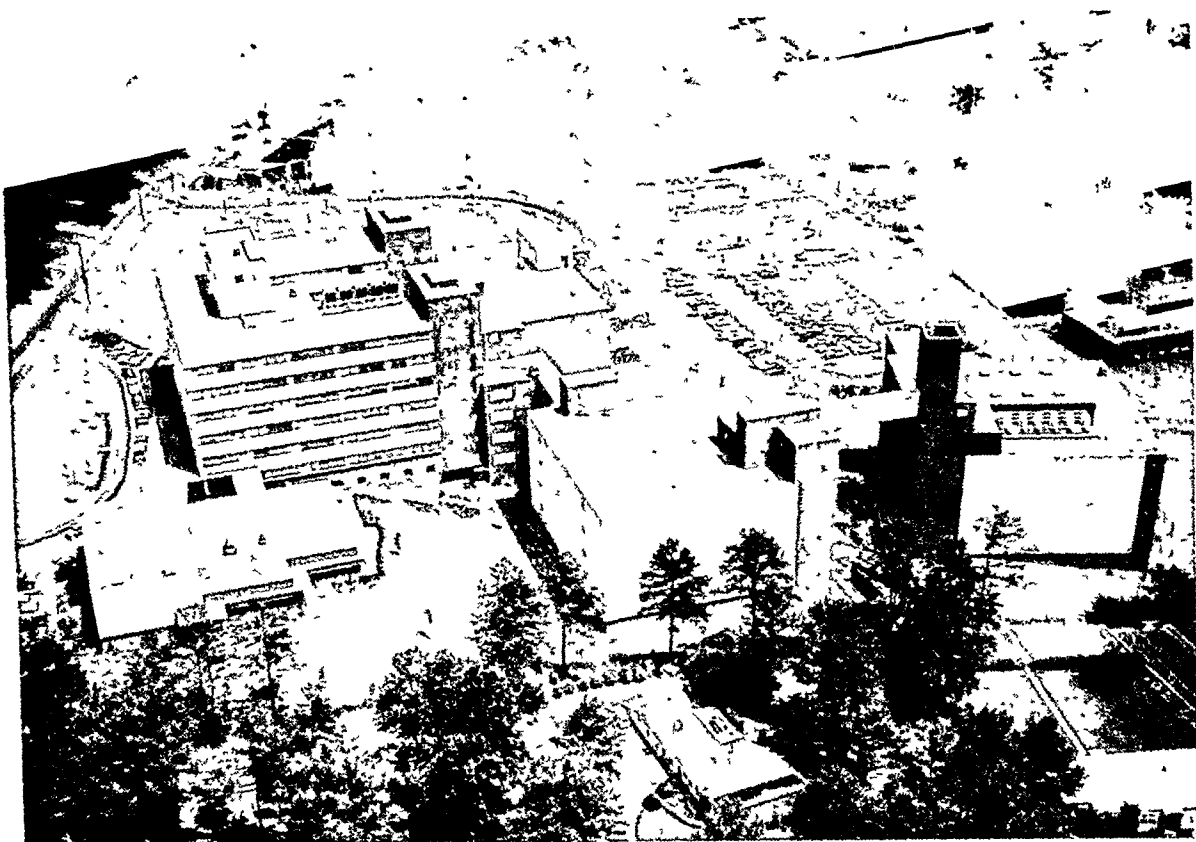
2,109 pregnancies, only 809 children were alive. From the mothers' descriptions, it appeared likely that most of the deaths were caused by tetanus.

The mothers are convinced that the chances for even a normal child to live are very small, the nurse reported. "For some, the devil's spirits in the region are very powerful, and the tetanus crises and convulsions are due to possession of the babies by the devil's spirits."

With the concurrence of Haiti's Minister of Public Health SCISP has appointed a medical coordinator for public health activities in the valley. Aside from the hospital, the only facilities there are one SCISP clinic-dispensary and several small dispensaries operated by the ministry. These have been devoted primarily to curative services.

Representatives of the ministry, the development organization for the Artibonite Valley, the U.S. Operations Mission, the hospital, and SCISP have agreed to establish and operate a field training center in the vicinity of the hospital where recent graduates of the medical and nursing schools and employees of the ministry will spend several weeks. The plans include a health center building, dormitories for trainees, and housing for a physician, sanitarian, and nurse.

—EDWARD E. MINTY, acting chief, division of public health, U.S. Operations Mission, Haiti.



This is an air view of the new headquarters facility of the Communicable Disease Center, Public Health Service, in Atlanta, Ga. It occupies 15 acres adjoining the campus of the Emory University—ground that was donated to the Service by Emory about 10 years ago. The plant comprises the main building (*upper left*), which houses the administrative offices of the Center and of the five branches (epidemiology, laboratory, technol-

ogy, training, and venereal disease), together with many of the laboratories; the auditorium and cafeteria (*lower left*); the infectious disease laboratory building (*right center*); and the virus disease laboratory building (*right*). The building for audiovisual and related activities is back of and partially hidden by the main building. The facility was occupied by CDC about July 1, 1960, and was formally dedicated on September 8.

## Highlights From the 1959 Report of the Communicable Disease Center

CDC continued to serve as the International Shigella Center, the National Shigella Center, the National Escherichia Center, the National Salmonella Center, and the National Typhoid Phage-Typing Center. A new serologic test to detect typhoid carriers should prove useful in screening large numbers.

A Staphylococcus Surveillance Unit was established as a coordinat-

ing center for information, to maintain liaison with the many investigators in the field, and to answer specific questions, compile references, and review the various directives and reports.

An increase was seen in the overall incidence of the venereal diseases during 1959, and the continuing rise in primary and secondary syphilis was sharply accelerated.

To stimulate more complete and more uniform reporting, CDC designed a Standard Venereal Disease Epidemiologic Report Form, to replace the 48 different forms used by the States.

In Puerto Rico, a serious epidemic of scarlet fever began in early 1955 and continued well into the summer. Following the elevated incidence of streptococcal infection

acute glomerulonephritis occurred. All evidence pointed up the need for strengthened surveillance of streptococcal diseases and acute glomerulonephritis in Puerto Rico.

The list of known disease-producing organisms and their serotypes is well over 1,000. Diagnostic reagents were commercially available for about 100 disease agents.

New courses developed and presented included epidemiology and control of vector-borne diseases; epidemiology for veterinarians; milk-sanitation administration; venereal disease control and epidemiology for nurses, and a medical parasitology extension course.

Mounting evidence indicates that histoplasmosis is contracted by exposure to the fungus at localized point sources rather than by inhalation of infected air in the general atmosphere of the surrounding area.

In ringworm studies, results indicate that griseofulvin exerts marked curvative effects, with few individuals showing signs of toxicity. It appears possible to eliminate a major source of *Microsporum canis* infection in humans by controlling infections among cats in cat-breeding establishments. Experimentally, this was accomplished by giving the animals griseofulvin orally and using "Captan" solutions as a dip for them and a disinfectant for their environment.

At Bangor, Maine, where essentially no cases of hepatitis had been seen during the previous 2 years, eight adults with severe infections were found to be patients of a single physician.

During 1958, 5,787 cases of poliomyelitis were reported to the National Office of Vital Statistics, an increase of about 5 percent over 1957. There was almost a 50 percent increase in the number of paralytic cases. About half the paralytic poliomyelitis was in children under school age. In contrast, during 1952 and 1955, before widespread use of the vaccine, school-age children were most severely involved. The proportion of persons who are adequately immunized is markedly lower in the low socioeconomic areas. School children between the ages 5 and 14 years are the best protected. Continuing studies on poliomyelitis-like diseases showed that paralysis can be caused by enteroviruses other than polioviruses, but it tends to be milder and is usually reversible.

To test the possibility that insectivorous bats may serve as asymptomatic carriers of rabies, 200 were collected and their salivary glands and brains tested for virus. One bat that had virus in the saliva when captured survived for 6 months. Another bat, kept under observation in confined isolation, showed virus in the saliva at the end of a 17-month period and survived an additional 4 months. Simi-

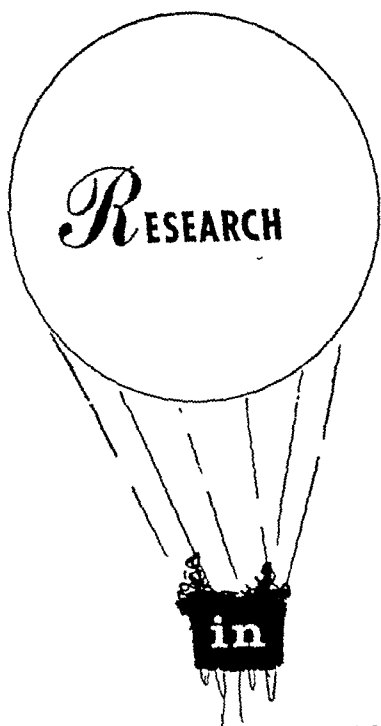
lar studies of terrestrial vectors showed no asymptomatic carriers among these animals.

On the basis of critical dosage level and survival time of roof rats fed different concentrations of rodenticides in yellow cornmeal, Diphacinone appeared to be a more effective poison than warfarin or Pival.

Streptococcal infections were a prime target in fluorescent antibody work. An effective reagent was developed and methods for its routine production were refined. Studies on 350 patients proved the method as sensitive and specific as conventional procedures, yet requiring only 2 to 3 hours in contrast to the usual 3 to 5 days. (See *Public Health Reports*, February 1960, p. 125, for a report on fluorescent antibody tests for gonorrhea in women.)

There were 2,587 cases of infectious encephalitis reported for 1958, a 21 percent increase, and 344 of them were identified as arthropod-borne infections.

Although immunizing against pertussis is widely practiced in this country, more than 30,000 cases of the disease are reported each year. The most serious illnesses are in babies under 1 year of age. CDC developed a hemagglutination test as a means of measuring antibody response to the vaccine. Newborn infants indicated an ability to produce antibodies as readily and in as high titers as older individuals.



# Air Pollution

## CONFERENCE REPORT

As public interest and concern over air pollution increases, scientists and technicians are devising ever more sensitive techniques for measuring pollution and its effects. These techniques range from sampling devices mounted on aircraft to time-lapse photography of low-level inversions to gauging the cellular and subcellular effects of pollutants on experimental animals.

To further the exchange of information on current research, methods, and findings, the

Public Health Service sponsored the Third Air Pollution Research Seminar held in New Orleans on March 22-24, 1960. Summaries of the 81 papers given at this forum are presented in the following pages. The full proceedings of the seminar will not be published since most of the authors have published or are in the process of publishing complete accounts of their work. Individual authors should be contacted directly for more detailed information on specific projects.

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### *International Aspects*

Dr. Christian E. Junge, Air Force Cambridge Research Center, Bedford, Mass., discussed the continental and global aspects of air pollution. He said that the concentrations of two atmospheric constituents, carbon dioxide and sulfur dioxide, have increased on a global scale as a result of human activity. Any fluctuations in CO<sub>2</sub> concentration will have a profound influence on world climate. While the CO<sub>2</sub> concentration has increased but 10 percent since the age of industrialization, it has been estimated that the increased use of energy

by the turn of the next century may result in an alarming CO<sub>2</sub> concentration in the earth's atmosphere. The sulfur concentration has increased much more because of the lower natural level in the earth's atmosphere. Recent measurements of sulfate in rainwater show higher concentrations in inland and northeastern parts of the United States, which may be associated with comparable industrial activity, Dr. Junge said. Because of the complex "washout" mechanism, care must be taken in interpretation of rainwater concentration in relation to air concentration; broadly speaking, however, air con-

centration and rainwater concentration are parallel. On a global basis, 30 percent of the sulfur "injected" into the atmosphere is a result of human activities.

Dr. Morris Katz, Department of National Health and Welfare, Ottawa, discussed air pollution research in Canada. Studies are in progress to evaluate the extent of air pollution from common gaseous and aerosol contaminants in various parts of that country. Studies involving industrial emissions concern the pollution of the atmosphere by fluorides, hydrogen sulfide, sulfur dioxide, and organic sulfides. An assessment of the components of exhaust gases from locomotive diesels, considering various operating conditions and fuel types, has been undertaken. An assessment is being made of the carcinogenic hydrocarbons and other organic compounds in smoke and particulates of urban air and in automobile and diesel exhaust gases. A national air sampling network is being organized to correlate and exchange data. A meteorological tower has been equipped in Ottawa, together with a number of air sampling stations throughout the city; data will be correlated with source evaluations within each city block.

Arthur C. Stern, Air Pollution Division, Robert A. Taft Sanitary Engineering Center, Cincinnati, Ohio, described air pollution research in Europe. In Great Britain, he said, air pollution research efforts are concentrated on the smokeless combustion of solid fuels, development of smokeless fuels, behavior of steam power plant stack fumes, etiology of chronic bronchitis, and the general problem of sulfur oxides in the air. In West Germany, a large research program has been initiated, with emphasis on the  $\text{SO}_2$  cycle (formation, emission, diffusion, and effects on vegetation), the measurements of air pollution, the meteorological parameters associated with pollution dispersion, and the properties of dusts and aerosols. The major research effort in Belgium is related to air pollution effects upon vegetation and upon man, measurements of air quality, and meteorological and climatological aspects of air pollution. The major activities in Italy are studies of carbon dioxide, sulfur dioxide, and particulate matter, and investigations of lead and polynuclear hydrocarbons. The major

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This summary of proceedings at the Third Air Pollution Research Seminar was edited by Dr. Roy O. McCaldin, Air Pollution Engineering Research, Robert A. Taft Sanitary Engineering Center, Public Health Service, Cincinnati, Ohio. Section reporters were John S. Nader, Sampling and Identification; Robert A. McCormick, Meteorology; Dr. C. Stafford Brandt, Effects of Air Pollution; Frank E. DeMartini, Engineering; Elbert C. Tabor, Environmental Levels of Pollutants; Andrew H. Rose, Jr., Automotive Exhaust Research; and Dr. James P. Lodge, Jr., Chemistry, all of Air Pollution Engineering Research.

Also, Ralph C. Graber, International Aspects, and Robert Porter, Community Studies, both with the Air Pollution Engineering Branch, Washington, D.C.; Dr. Thomas R. Mazzocco, Pulmonary Physiology, and Dr. Glen A. Fairchild, Pathology, both with the Air Pollution Medical Branch, Washington, D.C., and Dr. Herbert E. Stokinger, Toxicology, of Occupational Health Field Headquarters, Cincinnati.

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research in France relates to the measurement of air quality in the city of Paris. Air pollution research effort in Europe is comparable to that in the United States in size and scope. In the United States, research results are rapidly disseminated; in Europe, however, language and political barriers not only impede dissemination of results but lead to duplication of effort.

Dr. Benjamin S. Levine of Washington, D.C., reported on air pollution research in the U.S.S.R. Research in air pollution began some time ago in central and widely scattered sanitary hygienic and occupational health institutes. At first, attention was centered almost entirely on workroom, shop, and production plant air. Community air pollution research was initiated some years later, and standard allowable limits were adapted on an arbitrary, but temporary basis. Without waiting for results of time-consuming investigations, limits of allowable atmospheric air pollution were accepted as one-third of the limits adopted for factory air for corresponding pollutants. As research progressed and rational data were accumulated, arbitrary standards were amended or replaced. In addition to clinical research and experimental animal studies, research has

been undertaken which relates to the development and application of methodology for air pollution measurement. The general approach has been to assign the investigation of a given pollutant to a specific institute. The institute was expected to study all aspects of the pollutant—its sources, concentration, and pathophysiological effects—and to recommend a safe limit of emission into the atmospheric air. In the development of allowable limit concentrations for specific pollutants one unique aspect of Soviet research has been the application of aberration measurements of conditioned reflexes during experimental exposure of animals to different pollutant concentrations. By these and other methods limits of allowable concentrations have been set for 30 industrial air pollutants in the U.S.S.R.

### *Sampling and Identification*

Dr. James P. Lodge, Jr., reported for Gifford M. Mast, Mast Development Co., Inc., Davenport, Iowa, on the microcoulomb ozone sensor, a recent compact instrument development in ozone sensing and monitoring. The principle of operation, originally developed by Dr. Alan W. Brewer of Oxford University, consists of an oxidation-reduction reaction of ozone in an air-stream sampled over a film of buffered potassium iodide. The flow of electrons released in the reaction results in a signal output continuously monitored on the instrument's millivolt recorder with full-scale calibration of 0–100 parts per hundred million of ozone by volume. The reaction time built into the instrument tends to make the analysis specific to ozone, but a small amount of interference is produced by nitrogen dioxide and sulfur dioxide, which are normally found in atmospheric air.

Robert Lindsay reported for J. C. Beckett of the Wessix Electric Heater Co., San Francisco, Calif., on a new method of measuring ion mobility distribution which offers another index of air pollution. The instrumentation consists of a radioactive ion generator to pre-ionize the air sample, a standard parallel plate type ion collector, an ion trap to selectively remove high mobility ions, a stepping switch for automatic operation, and a micromicroammeter and recorder. Measurement can be made of the mo-

bility of air ions, in the range of values from 4 to 0.052 cm. per sec. per volt per cm. for concentrations as high as  $5 \times 10^5$  ions per cc. Ordinary clean air was found to contain small ions (millimicron size) having a mobility greater than 0.1 cm. per sec. per volt per cm., while typical urban air pollution depressed the number of small ions and increased the number of intermediate ions (3 to 50 millimicron size range) in the mobility range from 0.1 to 0.002 cm. per sec. per volt per cm. The small ions were thought to be clusters of  $O_2$  and  $CO_2$  molecules with excess charge, intermediate ions to be larger clusters, and large ions (0.05 to 1 micron) to be dust particles. The large ions might also be atmospheric condensation products consisting of salt particles such as  $(NH_4)_2SO_4$ . There was no information on the question of the effect of relative humidity on the type and amount of charge taken on by the ions.

Dr. Robert Baker, Laboratories for Research and Development, The Franklin Institute, Philadelphia, Pa., presented a study of sampling techniques to determine the effects of various storage techniques and materials on known concentrations of gases sampled from the atmosphere. Gases were monitored at varying storage time intervals, using a 10-meter cell infrared spectrometer and gas chromatographic procedures. Compression storage in steel cylinders at 150 psig resulted in high loss of mineral oxides ( $SO_2$  and  $NO_2$ ) in the compressor and little loss of hydrocarbons. Storage at atmospheric pressure in steel cylinders showed no significant loss in either case while comparable storage in glass flasks showed high loss for  $SO_2$  and  $NO_2$ . Storage in polymeric film fabricated bags at atmospheric pressure showed that soluble mineral oxides were affected by chemical reaction and moisture permeability, and hydrocarbon loss was sustained by gaseous diffusion. The two-film bag was recommended, the inner film as impermeable to the gas of interest and the other film to moisture. Of the plastics studied aluminized-Mylar was found to be the least permeable to moisture. A dark reaction did not occur after 46 hours of storage of a mixture of  $SO_2$ ,  $NO_2$  and 2-pentene.

Helmut K. Weickmann, U.S. Army Signal Research and Development Laboratory, Fort Monmouth, N.J., discussed aerosol measure-

ments in Greenland conducted in areas near the coast and in the interior in July 1957, March 1958, August 1958, and August 1959. In the summer, particle concentrations near the coast and permafrost soil were found to vary from less than 100 to more than 1,000 particles per cubic centimeter in the diameter size range from 1 millimicron to 1 micron. Upwind of sources of contamination, about 200 miles inland from the coast and over the icecap, the concentration was in the neighborhood of 1 to 3 particles per cubic centimeter in a narrow size range of about 1 micron diameter. The Aitken, Rich, and Polak nuclei counters were used as well as the cascade impactor and the Goetz spectrometer for collection and measurement of such small particles at these extremely low concentrations.

Morris A. Fisher, Armour Research Foundation, Illinois Institute of Technology, Chicago, discussed studies on particulate air pollution in terms of the problems of sampling, analysis, and correlation of data. These problems were discussed in relation to brief summaries of particle count and size measurements with the Aerosoloscope (a light scatter analyzer), directional sampling of suspended dust, the use of the electrostatic precipitator for sampling and quantitative separation, and of studies of radioactive fallout, its separation in the dry form, and the interaction of small particles with a water drop.

Dr. Walter C. McCrone, Walter C. McCrone Associates, Chicago, reported on the characterization and identification of smoke and fly ash by means of the microscope, a study in which various types of particulate air pollutants are characterized by microscopic morphology. Photographs are being made under standard conditions of as many as possible of the different types of particles found in wind erosion products, industrial dusts, and combustion products for compilation in an atlas which will include the history of the end product. There are indications that various sources of smoke and fly ash can be unequivocally identified. The morphology of these particles is found to depend upon the type of fuel, equipment, and operation used in the combustion process. These methods can be used to obtain information on the percentage of smoke and fly ash contributed by various sources, the geographic distribution of fly ash from a given industrial

stack, the percentage of smoke and fly ash in total settled or suspended dust samples, and the operating efficiency of a given industrial stack.

Dr. Harold L. Helwig, California State Department of Public Health, Berkeley, discussed particle sizing and analysis in community air pollution studies in which he emphasized the need of data on the physical and chemical characteristics of particles in polluted air for the elucidation of questions about various air pollution effects. The Goetz particle spectrometer was studied as an instrument suitable for field use and for collection and analysis of submicron particles with minimal change in their properties. Modifications of the instrument were made to overcome rotor heating by circulation of coolant fluid and to reduce bypass flow of sample air around the centrifuge rotor by means of a self-contained system of pressure compensation. Efficiency of particle collection, using polystyrene latex spheres dispersed by an aspiration technique developed in the study, was found to be 100 percent with an accuracy of  $\pm 15$  percent for the diameter size range from 0.2 to 1 micron and for airflow rates up to 12.5 liters per minute. Dr. Alexander Goetz, California Institute of Technology, Pasadena, reported that his work showed this efficiency to extend down to 0.08 microns and also indicated that newer models of the spectrometer were modified to compensate for bypass airflow.

Charles W. Gruber, air pollution control and heating inspection, Cincinnati Department of Safety, reported on the Scentometer, an odor-level measuring device, developed as the result of a Public Health Service grant on techniques of urban odor measurement. The Scentometer is a portable instrument utilizing the human respiratory system as the source of suction for sampling ambient air and containing an activated charcoal layer to furnish "odorless" air and a system of orifices calibrated for various airflow rates. The measurement technique consists of diluting the odorous ambient air with odorless air to a minimum detectable threshold level. Results are reported in whole numbers as dilution to threshold (D:T) by the observer, where the number is the sum of the parts of odorless air required to dilute one part of odorous air to threshold plus the part of odorous air. The current model of the Scentometer

has been designed with five dilution orifices which give the D:T values of 1, 2, 8, 32, and 128. The value of 8 was found to represent borderline cases of odor complaint in the field. Values of 32 and 128 were definitely odor problems. Odor from the activated charcoal itself did not interfere with the observer's evaluation, and the charcoal failed to render odorless any ambient air having coffee roasting odors. To avoid the problem of fatigue, the device is used initially at high dilutions and then at higher concentration values. Additional study is being conducted on the variability in sensitivity of individual observers. The device's potential as a tool for the enforcement of ordinances appears to have been realized; the use of a similar device was reported to have been written into the ordinances of two county control agencies.

## Meteorology

Frederick E. Bartlett, meteorologist, Brookhaven National Laboratory, Upton, N.Y., described the use of oil fog and radioactive materials as tracers in long-range diffusion studies. These techniques have been developed for concentration measurements in a plume from a single source out to distances of 30 to 40 miles from the Brookhaven site. The sampling devices were mounted on a light aircraft which made passes through the plume, normal to the axis, at various elevations and distances from the source. The greatest practical problem in the experiments was the exact positioning of the aircraft in space when traversing the plume. During stable conditions the apparent diffusion of the plumes was less than that expected by the investigator.

Irving A. Singer, meteorologist, Brookhaven National Laboratory, Upton, N.Y., reported on preliminary analysis of peak to mean surface concentration ratios of pollutants from an elevated source. At distances of 1 to 2 kilometers, values on the order of 4 were found in high-wind conditions and 14 or 15 in convective regimes at Brookhaven National Laboratory. These ratios were noted to be in agreement with similar data obtained elsewhere, but higher than those to be expected of pollutants in urban areas.

Dr. Francis E. Gartrell, Tennessee Valley

Authority, Chattanooga, Tenn., reported on dispersion of stack gases. SO<sub>2</sub> concentrations were measured during stable atmospheric conditions in plumes up to 10 miles from the source, a TVA power plant, by means of a Titrilog adapted for operation in a helicopter. This revealed that the concentrations are nearly normally distributed in the crosswind and vertical dimensions. At all distances the ratio of the maximum to average concentrations was nearly constant. On a number of days substantial decreases, in the order of 20-40 percent, in a total SO<sub>2</sub> flux in successive plume cross sections were found at distances 1 to 6 miles and for time periods of 60 to 80 minutes. These losses may be only apparent and due to the difficulty of obtaining accurate estimates of SO<sub>2</sub> flux at greater distances. However, laboratory experiments measuring the extent of SO<sub>2</sub> oxidation were in agreement with the order of magnitude of the SO<sub>2</sub> loss observed in the plumes.

Sidney R. Frank, Aerometric Research, Inc., Santa Barbara Airport, Goleta, Calif., used time-lapse photography from an elevated vantage point near Santa Barbara to investigate the fine structure of low-level inversions. Observations of the top of stratus clouds in the marine layer indicated that the top of the stable layer was not as smooth and uniform as might be expected, but was marked by a complicated eddy structure. Further, several "stability levels" were to be found within the "gross" stable layer which can trap urban contaminants and subject them to differential relative horizontal movements. It was noted that information concerning the mean height of the inversion base could be obtained by monitoring the signal intensity from a television station in San Diego, some 200 miles away. This results from the significant correlation between the TV signal intensity and the height of the electromagnetic-ducting layer associated with the inversion base.

Donald H. Pack, meteorologist, U.S. Weather Bureau, Washington, D.C., reported on progress in the development of metalized Mylar constant-level tetroons (tetrahedron-shaped balloons) which could be tracked by radar. Experiments to date indicated that the motions of the tetroons could reasonably be identified



ments in Greenland conducted in areas near the coast and in the interior in July 1957, March 1958, August 1958, and August 1959. In the summer, particle concentrations near the coast and permafrost soil were found to vary from less than 100 to more than 1,000 particles per cubic centimeter in the diameter size range from 1 millimicron to 1 micron. Upwind of sources of contamination, about 200 miles inland from the coast and over the icecap, the concentration was in the neighborhood of 1 to 3 particles per cubic centimeter in a narrow size range of about 1 micron diameter. The Aitken, Rich, and Polak nuclei counters were used as well as the cascade impactor and the Goetz spectrometer for collection and measurement of such small particles at these extremely low concentrations.

Morris A. Fisher, Armour Research Foundation, Illinois Institute of Technology, Chicago, discussed studies on particulate air pollution in terms of the problems of sampling, analysis, and correlation of data. These problems were discussed in relation to brief summaries of particle count and size measurements with the Aerosoloscope (a light scatter analyzer), directional sampling of suspended dust, the use of the electrostatic precipitator for sampling and quantitative separation, and of studies of radioactive fallout, its separation in the dry form, and the interaction of small particles with a water drop.

Dr. Walter C. McCrone, Walter C. McCrone Associates, Chicago, reported on the characterization and identification of smoke and fly ash by means of the microscope, a study in which various types of particulate air pollutants are characterized by microscopic morphology. Photographs are being made under standard conditions of as many as possible of the different types of particles found in wind erosion products, industrial dusts, and combustion products for compilation in an atlas which will include the history of the end product. There are indications that various sources of smoke and fly ash can be unequivocally identified. The morphology of these particles is found to depend upon the type of fuel, equipment, and operation used in the combustion process. These methods can be used to obtain information on the percentage of smoke and fly ash contributed by various sources, the geographic distribution of fly ash from a given industrial

stack, the percentage of smoke and fly ash in total settled or suspended dust samples, and the operating efficiency of a given industrial stack.

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could be calculated. In some individuals whose conventional ventilatory measurements were normal, the contour of the flow-volume loop was abnormal. These changes were attributed to increased airway resistance suggestive of early pulmonary disease. The findings suggest that flow-volume loops may identify early lung diseases not apparent from other measurements. Dr. Branscomb stated that his major objection to any type of peak flow measurement by conventional instruments was that no measurement of function near the end of expiration was made and that this area was probably the most important in detection of early disease.

The high frequency spirometer with oscillographic recorder was the subject of considerable discussion because of its possible adaptation to field testing. The present apparatus could be reduced in size by use of transistorized circuits, but even in its present form it is transportable by bus or trailer. The cost was approximately \$15,000, which is lower than a portable X-ray unit. The respiratory loops can be obtained at the rate of one person every 3 minutes and are easy to record and develop.

Dr. James E. Long, University of Pittsburgh, Pittsburgh, Pa., investigated pulmonary impairment from deep lung irritants in rats by measuring the rate of respiratory uptake of carbon monoxide -C<sup>14</sup> and oxygen at hourly intervals after a half-hour exposure to phosgene. The magnitude of impairment increased sharply above 2.0 ppm phosgene.

Oxygen deficit and carbon monoxide deficit were defined as the ratio of normal consumption (adsorption) to noted rate of consumption (absorption) at a specific time following pulmonary insult. Since it was noted there was an oxygen deficit, the question was raised whether the metabolic rate had been lowered. Dr. Long explained that the blood oxygen saturation studies by intracardiac puncture indicated the difference was not due to metabolic rate, but to inability of oxygen to diffuse, presumably because of edema. The oxygen deficit was noted to be less than the carbon monoxide deficit. This was explained on the basis that the oxygen absorption was partially dependent on pulmonary blood flow, while carbon monoxide was not.

Secondary insult exposures were imposed

after edema had developed due to damage from nitrogen dioxide or phosgene at concentration levels producing 25 to 30 percent mortality. The secondary insult exposures failed to indicate any potentiating effect either in respect to the overall mortality or in the mortality-time experience.

Dr. Robert Frank, Harvard School of Public Health, Boston, Mass., reported on respiratory responses to sulfur dioxide in controlled human exposure. The effects of SO<sub>2</sub> alone and with an aerosol on the respiratory mechanics of healthy human subjects was measured by an esophageal catheter and a body plethysmograph. Thirteen subjects were exposed 26 times to concentrations of gas ranging from 1 to 20 ppm. During exposure to SO<sub>2</sub> alone, there was no change in pulmonary flow resistance at concentrations of 1 to 2 ppm, 19 percent increase (above control) from 4 to 5 ppm, while at 8 to 19 ppm it rose 49 percent. The average response to aerosol plus SO<sub>2</sub> in concentrations of 8 to 20 ppm was 72 percent.

The findings of Dr. Wright which follow are contrary to those of Dr. Frank. The discussion on the effect of SO<sub>2</sub> is given after Dr. Wright's paper.

Dr. George Wright, St. Luke's Hospital, Cleveland, Ohio, investigated the pulmonary reaction of normal and emphysematous persons to the irritations of SO<sub>2</sub>, fly ash, and moisture. Eight normal men and four persons having diffuse obstructive emphysema were exposed for 20 to 25 minutes to SO<sub>2</sub> in concentrations ranging from 2.5 to 23 ppm, particulates less than 10 microns in size varying from 6 to 1.2 million particles per cubic foot, and water aerosol. Airway resistance, maximum and minimum midexpiratory flow rates, maximum breathing capacity, timed vital capacity, pulmonary volumes, and ventilation effectiveness were measured before and within 20 minutes after exposure. The normal subjects showed no trend as to resistance changes consequent to exposure. None of the variations following the exposure were greater than hour-to-hour or day-to-day variations of control, nonexposed persons. Four men having classic clinical and physiologic evidences of diffuse obstructive emphysema were exposed for 20 minutes to 5 ppm SO<sub>2</sub>, 6.0 million particles per cubic foot,

with motions of air parcels of comparable volume, and reliable information could be obtained of air trajectories and of the structure of turbulent flow following the fluid motion (that is, Lagrangian statistics). Daytime flights, 10 to 100 miles in extent and at elevations of a few hundred to a few thousand feet, showed the variance of the lateral component of the motions to exceed the vertical by about a factor of 4, while maximums of the turbulence spectra, converted empirically to a local time equivalent, were in agreement with findings of other workers. With prior knowledge of the vertical temperature structure in the atmosphere, the tetroons could be positioned within plus or minus 200 feet of any desired altitude.

Dr. Jack E. Cermak, professor of mechanics and civil engineering, Colorado State University, Fort Collins, Colo., reported on diffusion from a point source in a wind tunnel test section. It was found that in simulated atmospheric instability conditions the effect of surface roughness was to decrease the rates of diffusion, in both the lateral and vertical direction, from that observed when the surface was smooth. It was tentatively hypothesized that the surface roughness broke up large-scale turbulence of pure convective motions into smaller scales less effective for diffusion. The existence of intermittent vortexes in the flow emerging out of the boundary layer was also noted. These vortexes were on time scales of the order of hundredths of a second and were not noticeable in the mean velocity profiles.

Raymond Smith, chief, air pollution control section, Philadelphia Department of Public Health, reported on the urban atmosphere's ability to renew and purify itself. This was revealed during an investigation of natural ventilation rates over Philadelphia. He concluded that the influence of prevailing winds on the air pollution situation in the city was largely beneficial, as maximum pollutant concentrations were associated with winds from other directions. On the average, 45 periods of short duration and 1 long period (2 to 3 days) of low ventilation conditions are experienced per year. A somewhat more favorable picture had been suspected prior to the study.

Dr. E. Wendell Hewson, professor of meteorology, University of Michigan, Ann Arbor, de-

scribed a system for forecasting dispersion of ragweed pollen. Data for 1959 were used to establish a technique to predict the daily departure from the normal of the ragweed pollen concentrations. A statistical study using a correlation matrix of 18 parameters revealed that wind direction, maximum temperature, and dew point were the best predictors and hence were utilized in the system of testing on independent data during the 1960 season.

## Pulmonary Physiology

Dr. Richard Ehrlich, Armour Research Foundation, Chicago, discussed the effects of atmospheric pollutants on susceptibility to respiratory infection. The specific pollutant used during the present phase of the investigation was ozone and the micro-organism causing the infection was *Klebsiella pneumoniae*. In the preliminary phase of the program the virulence and viability studies of the organism were conducted to determine the LD<sub>50</sub> for mice. Experimental conditions included exposure of Swiss albino mice to ozone prior to the challenge with bacterial aerosol and aerosol challenge prior to ozone exposure. In every case the mortality was greater for mice previously exposed to ozone. An exact recovery time was not determined, but on one occasion a delay overnight before insulting with bacteria still caused an increase in mortality. Dr. Ehrlich speculated that ozone might have its activity embodied in an anesthetic action on the cilia.

Dr. Ben V. Branscomb, University of Alabama Medical Center, Birmingham, reported on the measurement of pulmonary function in epidemiological surveys with the Wright peak flow meter, McKesson Vitalor, Monaghan puff meter, Collins 13½-liter spirometer, and a special high frequency spirometer with oscillographic recorder. These devices were installed in a bus in which 24 different measurements were carried out on volunteers. The studies included maximal inspiratory and expiratory efforts with airflow recorded in relation to volume within the vital capacity. These "maximum flow-volume" loops were found to be easy to calibrate and analyze. From these loops all measurements available from the other pieces of apparatus, except the maximum breathing capacity,

could be calculated. In some individuals whose conventional ventilatory measurements were normal, the contour of the flow-volume loop was abnormal. These changes were attributed to increased airway resistance suggestive of early pulmonary disease. The findings suggest that flow-volume loops may identify early lung diseases not apparent from other measurements. Dr. Branscomb stated that his major objection to any type of peak flow measurement by conventional instruments was that no measurement of function near the end of expiration was made and that this area was probably the most important in detection of early disease.

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and added water aerosol. Each individual demonstrated a decrease in the airway resistance, and no change in other measurements following the exposure. A vigorous discussion followed, as the results of Dr. Wright do not agree with those of Dr. Frank, who found an increase in airway resistance after exposure to  $\text{SO}_2$ . Dr. Patrick J. Lawther, St. Bartholomew's Hospital, London, stated that his findings indicated that, with the exception of the rare  $\text{SO}_2$  sensitive individuals, the net effect of  $\text{SO}_2$  exposure was a slightly beneficial loosening of mucus within the bronchial tree.

Dr. Frank stated that this was contrary to his findings;  $\text{SO}_2$  above 5 ppm would produce a statistically significant change in airway resistance. Attempts by the group to explain this discrepancy brought out the fact that there was a slight lag time in Dr. Wright's measurement after exposure, while Dr. Frank's subjects were measured while breathing the gas. In addition, it was pointed out that Dr. Frank's subjects mouth-breathed, bypassing whatever protective action is supplied by the nasal passages, while Dr. Wright's subjects were free to nose-breathe, thereby possibly increasing the washout of  $\text{SO}_2$ .

Dr. Branscomb added to the discussion the fact that numerous intermittent exposures to 1 percent  $\text{SO}_2$  from an aerosol bomb over a 40-minute period produced no change in respiratory loops on his testing equipment but caused cough and expectoration.

Dr. Roger Wilson, University of California Medical Center, San Francisco, reported the results of a 3-year study of the effects of weather and of air pollution in patients with chronic bronchitis and emphysema from a sporadically polluted area in San Francisco. Studies were limited to simple ventilatory tests and diaries kept by patients. An immediate irritant effect separate from the Los Angeles studies of Motly is implied from the demonstrated relationship between worsening ventilatory tests and an ambient pollution level higher than the average in the community. Double blind studies with bronchodilators and cough suppressors show a suggestive reversal of the adverse pattern.

Dr. Thomas Lloyd, Jr., St. Luke's Hospital, Cleveland, Ohio, discussed methods commonly used for recognizing acute changes in airway resistance. The body plethysmograph, Clem-

ents interrupter, Wright peak flow meter, maximum breathing capacity, and forced expiratory vital capacity were used for pulmonary function testing. Data indicated that the body plethysmograph was a highly sensitive indicator of an induced change in airway resistance and the Clements interrupter was a very insensitive method. The remaining methods varied to a minor degree, and choice between them would depend on other factors. These methods covered a middle ground of sensitivity, but all could be considered clinically useful.

### *Effects of Air Pollution*

Dr. George H. Hepting, Forest Service, U.S. Department of Agriculture, Asheville, N.C., was concerned with the possibility of air pollution as the causative agent of a needle blight of white pine found in the southern Appalachian region. The browning or blighting of the needles of conifers is common with many diseases and upsets of the tree. Dr. Hepting described the various blights of known etiology of the region. There remains one blight in the area for which the etiology has not been established. Air pollution may be a factor in this blight. In the discussion, Dr. Katz of Canada queried the speaker in some detail on comparative symptomology with sulfur dioxide injury. Effects similar to those described by Dr. Hepting are noted in Canada and differentiated from other blights.

In reporting on the studies conducted at Texas Agricultural and Mechanical College, College Station, by Dr. Wayne C. Hall and Dr. Walter W. Heck on the effects of ethylene on plants, Dr. Heck presented in detail the symptoms developed by this toxicant, especially on cotton. In addition to the known effect of abscission of the developing flower bud (square), there appears to be an alteration in growth habit best described as a loss of apical dominance.

Marcella Juhren, working at Los Angeles State and County Arboretum, Arcadia, Calif., with W. S. Stewart and W. M. Noble, reported some possible effects of oxidant type smog on plant growth. Using tomato root cultures, they found that "smoggy" air promoted the development of tertiary rootlets. From other data on the effects of plant hormones in relation to

sensitivity the Los Angeles workers believe that smog may be altering the hormonal balance in the plant. These two possible effects on the growth control mechanisms of plants reported by Dr. Heck and Mrs. Juhren may open up entirely new areas of investigations in this field of air pollution effects on plants.

Dr. Leonard M. Schuman, School of Public Health, University of Minnesota, Minneapolis, presented a progress report on an epidemiological study of silo fillers' disease. He reviewed some of the acute exposures to gas in silos, presumed to be  $\text{NO}_2$ , and reviewed his epidemiological evidence of a 10 percent excess of chronic pulmonary disease in a random group in one county with a history of work in silos.

Dr. Richard A. Call, Provo, Utah, presented autopsy findings on residents of an area which had experienced elevated atmospheric fluoride levels. His findings do not indicate any appreciable bone accumulation of fluoride due to the atmospheric exposure. However, the study has shown a relation between renal disease and bone fluoride levels above normal for the age group. Dr. Call suggested that the elevated fluoride levels were probably the result of the renal disease and had no relation to the cause of the disease. He intends to follow this lead in further studies because of the need for a better understanding of fluoride metabolism under conditions of renal impairment.

Dr. Harold J. Paulus, School of Public Health, University of Minnesota, Minneapolis, is studying the possible relation of air pollution from the grain industry to outbreaks of allergic asthma in the student body and staff of the university. Review of medical records of 228 asthma patients of the past few years gave evidence linking grain pollutants to individual asthmatic attacks.

Dr. Charles E. Schoettlin, consultant to the Air Pollution Medical Branch, Public Health Service, used two groups of men from a Veterans Administration domiciliary home to study the possible effects of urban air pollution on chronic respiratory disease. One group which had a high prevalence of chronic respiratory disease was compared with a control group selected from the same restricted population. The basic problems of sample selection, controls, and handling of data were discussed.

The problems of selection of response criteria and measures of air pollution used were outlined, and results of the study were reported. Smoking for 10 years or more was associated with an increased prevalence of chronic respiratory disease.

Dr. Herbert C. McKee, Southwest Research Institute, San Antonio, Tex., discussed the problems of corrosion in relation to atmospheric effects. Using examples from his work on corrosion of parts in ordnance material, Dr. McKee brought out the complexities of relating a specific corrosion problem back to the original pollutants and atmospheric conditions which were responsible for the corrosion. This requires detailed studies of atmospheric chemistry and of reactions at air-solid interfaces. It also often requires the persistence of a detective to determine all the possible substances available for reaction.

## Engineering

Dr. Hikmet M. Binark, former professor, Pennsylvania State University, now at the Technical University of Istanbul, Turkey, reported the results of an experimental and theoretical study of inertial impaction in cyclone separators. Impaction efficiencies were determined by measuring mist concentrations before and after passage through the collector under test. An oil mist, used as the test material, was sampled by use of rectangular jet stages which divided the samples into six size fractions. Other investigators reported that dense oil fogs tended to agglomerate and deposit on surfaces. These interferences were at a minimum in this work because of the low concentrations used. Theoretical calculations were based on complete mixing of droplets. Cyclone velocities were measured with a hot wire anemometer, and by changing orientation of the anemometer, flow patterns could be detected. Impaction efficiency was found to vary with the number of turns the airstream made, and the number of turns was dependent on the air inlet velocity.

Dr. Seymour Calvert, professor of chemical engineering, Case Institute of Technology, Cleveland, Ohio, spoke on a number of studies related to the fundamental mechanisms of gas and particulate collection. Oscillating bodies of

liquid attached to solid supports were evaluated with respect to their scrubbing effects when a gas stream was blown past them. In order to determine collection efficiency, the oscillating drops were removed from the wire support and analyzed for dust retention by blood counting techniques. Other studies on gas cleaning dealt with use of frothing agents to extend the gas-liquid interface and the use of strong secondary flow patterns in conduits to increase gas-liquid contact and improve the scrubbing effect of the liquid.

The report of Prof. E. R. Kaiser, senior research scientist, College of Engineering, New York University, New York City, on a variety of incinerator problems was read by James Halitsky. Work previously reported by N.Y.U. has shown how air pollution from flue-fed incinerators can be reduced by use of hopper locks on the flue, oversize air jets in the furnace, auxiliary gas firing, and flue-gas scrubbers. The use of barometric and orifice dampers in the flue is being evaluated since entrainment of particulate matter in flue gases can be markedly reduced by control of upward gas velocities during burning.

Plans are underway for research on incinerators for burning junked automobiles prior to the salvage of steel and other metals. A prototype suitable for burning 30 car bodies a day is to be built and tested. Smokelessness is to be achieved by an oil-fired afterburner.

Walter J. Smith, Arthur D. Little, Inc., Cambridge, Mass., discussed the use of bag filters in gas cleaning. Successful operation of glass bag filters requires proper fabric design, adequate fiber lubrication, correct mounting, minimum mechanical working of bag, and adequate maintenance. A number of proprietary compounds have been used as lubricants for glass fiber filters. These are for the most part silicone compounds. Though they are inorganic in nature, they do have some organic constituents that might be oxidized and thus cause problems. Colloidal graphite was one of the best lubricants tried by Arthur D. Little, Inc., provided it was worked well into the fibers of the filter material. Lubricated glass fiber bags have worked effectively at temperatures up to about 500° F. Bags used above this temperature have shown reduced service life.

Dr. Kenneth T. Whitby, University of Minnesota Institute of Technology, Minneapolis, described research being conducted on air cleaners for occupied spaces. Seventeen types of air cleaners have been evaluated with respect to stain efficiency, weight efficiency, loading characteristics, and efficiency of removal of natural airborne micro-organisms. Considerable work has been done with generation of aerosols for use in this evaluation. Homogenous aerosols of methylene blue have been created in ranges from 0.6 to 15 microns diameter. A generator for this purpose can be produced for less than \$500. An impactor with a Collison atomizer is being built to produce aerosols in the 0.1 to 1.0 micron range. A method has been developed to reduce agglomeration tendency of aerosols due to electric charges on them. The charge on aerosols is balanced by mixing with a high concentration of gas ions generated by an electrical ionizer.

James Halitsky, College of Engineering, New York University, New York City, reported on studies of vented gases around buildings. Many industrial buildings discharge combustion, laboratory, and process gas through short stacks on flush openings in sidewalls and roofs. Gases are eventually borne away by the wind, but not until they have circulated about the building, polluting air in the neighborhood of ventilation ducts and open windows. Wind tunnel studies were made of simple geometrical building shapes. With no buoyancy in the exhaust, the most important factor affecting the general level of contamination at points on a building distant from the exhaust opening is the turbulent wake of a building. Gas will sometimes be found at upwind locations on a building even if the exhaust is on the lee side. Eddy effects evidently play a major role in establishing the local pollution pattern. An equation was proposed which would permit translation of wind tunnel results to full-scale buildings.

### *Environmental Levels of Pollutants*

Randolph C. Specht, American Agricultural Chemical Co., Pierce, Fla., discussed the results of a study of the uptake of fluorides by grass grown on Florida soils which had been leached with water containing fluorides. It was demon-



strated that soils have the ability to fix fluoride ions from fluoric acids and calcium fluoride either directly or as components of superphosphates. Grass grown on soil previously leached with water containing fluorides showed approximately the same fluoride content as grass grown on soil leached with distilled water.

A new technique for the identification of malodorous kraft pulp mill effluents was described by Donald F. Adams, Division of Industrial Research, Washington State University, Pullman. The gaseous pollutants are first collected on activated silica gel, then transferred to a gas chromatograph for preliminary separation, after which the malodorous gases are trapped and identified by rechromatographing on a gas-liquid column. Retention of the different types of malodors is accomplished by adsorption and condensation at dry ice-acetone temperature. Desorption of the sample is brought about by sweeping the column with helium while increasing the temperature from  $-78.5^{\circ}\text{C}$ . to  $100^{\circ}\text{C}$ . After allowing trapped  $\text{CO}_2$  to escape, the eluted gases are collected in a liquid nitrogen trap. The condensed gases are analyzed in the conventional manner, using a gas-liquid column and the rising temperature technique. The study was sponsored by the National Council for Stream Improvement.

Humberto Bravo A., air pollution consultant, Instituto de Ciencia Aplicada, University City, Mexico, presented a report on pollutants found in the atmosphere of Mexico City in 1959. Monthly dustfall measurements, made in a residential area, ranged from 7 to 16 tons per square kilometer per month, with higher values during the rainy season (April-August), while those made in an industrial area ranged from 22 to 53 tons, with little seasonal variation demonstrated. Suspended particulate levels were lower during March through October, ranging from 40 to  $130\text{ }\mu\text{g}/\text{m}^3$ , with values from 70 to  $380\text{ }\mu\text{g}/\text{m}^3$  being observed during the winter months. The benzene soluble organic matter obtained from particulate samples contained a relatively high proportion of aromatic hydrocarbons. Gaseous pollutants were measured over a 6-month period with the following average values found: oxidants, 0.01 ppm;  $\text{SO}_2$ , 0.161 ppm;  $\text{NO}_2$ , 0.09 ppm; aldehydes, 0.24 ppm; and ammonia, 0.02 ppm.

Concentrations of carbon monoxide and carbon dioxide in the atmosphere of Mexico City were reported by Dr. Armando P. Baez, University of Mexico. Carbon monoxide levels, measured at 3.5 meters above street level, show variations that can be related to traffic density and meteorological conditions. Average concentrations at nose level ranged from 15 to 40 ppm, with maximum values three times the average. Carbon dioxide concentrations measured at 3.5 meters above street level showed little correlation with carbon monoxide concentrations.

J. Cholak, University of Cincinnati, Cincinnati, Ohio, discussed the findings of a continuous monitoring program conducted in Cincinnati from January 1957 through December 1959. Automatic apparatus was used to record the instantaneous concentrations of oxidant and nitrogen dioxide. Sequence samplers were used to sample the air for its content of sulfur dioxide. High-volume samplers were used to collect 24-hour samples of particulate matter. AISI smoke samplers were also operated at the stations in order to determine the soiling property of the air and the diurnal fluctuations in the concentrations of particulate lead compounds present in the air. Average hourly concentrations of oxidant ranged from less than 1 part per hundred million to 8 pphm at the downtown station and from less than 1 pphm to 24 pphm at the Avondale station which was centrally located in respect to local population density and general activity. The concentrations of oxidant varied seasonally, the highest concentration generally occurring during the summer months. Average hourly concentrations of oxidant greater than 15 pphm were present for only 14 hours (most of them in August) out of the 5,774 hours of monitoring at the Avondale station.

The concentration of nitrogen dioxide was always higher in the downtown area than for Avondale. At the downtown station average hourly concentrations less than 1 pphm occurred for 161 hours out of a total of 6,873 hours of continuous monitoring. Average concentrations of nitrogen dioxide in excess of 15 pphm were present for a total of 43 hours. The maximum hourly concentration of nitrogen dioxide was 20 pphm. At the Avondale station



716 hours of a total of 4,621 hours of sampling yielded average concentrations below 1 pphm. No average hourly concentration in excess of 15 pphm was present in the air at the Avondale station during 1957.

George D. Clayton, of G. D. Clayton and Associates, Inc., Detroit, Mich., discussed the relationship of street level CO concentrations to traffic accidents. Three recording infrared CO analyzers were set up at various locations in Detroit. One recorder was located for 27 weeks on a depressed highway within the city and showed CO readings ranging from 0 to 100 ppm with a median of approximately 8 ppm. Another recorder, placed in a busy neighborhood shopping area for 58 weeks, showed CO levels ranging from 0 to 100 ppm, with a median of 10 ppm. For 21 weeks a third recorder was operated in downtown Detroit, with CO readings of from 0 to 100 ppm and a median of approximately 9 ppm. The CO in the atmosphere of a residential area was sampled during a period of 18 weeks. Concentrations of from 0 to 29 ppm were recorded, with a median of only 2 ppm. Data were correlated with such factors as traffic count and meteorological conditions. From these data attempts were made to predict under what conditions dangerous concentrations of carbon monoxide can be created in the atmosphere.

Dr. Philip W. West, Louisiana State University, Baton Rouge, reviewed the use of aerial observations in the study of air pollution. Four years of experience have provided convincing evidence of the value in the use of aerial observations and aerial photography combined with chemical and physical studies of air pollution. Aerial photographs are particularly useful in correlating what can be seen with what is found by means of physical and chemical studies. Furthermore, aerial perspectives often prove convincing to plant personnel when analytical data fail to make a significant impression. Ground-to-air communications make it possible to effectively direct the sampling schedule so that the optimum sample points are selected. In addition, valuable information on temperature lapse rates can be obtained by following temperature gradients during takeoffs and landings.

## Toxicology

Three reports dealing with effects of gaseous air pollutants at cellular or subcellular levels indicate the concern of a number of investigators with the pathways by which these substances exert injurious effects in animals. Aliphatic nitro compounds, including unsaturated forms, have been implicated as components of gaseous air pollutants and studied as representative of eye and respiratory tract irritants (unsaturated forms).

Test concentrations, 4-6 ppm oxidant, as far as can be judged in tissue culture, are still far above realistic air pollution levels as were levels in subacute studies of animals exposed to nitro-olefins in research conducted by William B. Deichmann and William E. MacDonald, department of pharmacology, University of Miami School of Medicine, Coral Gables, Fla. Exposures to 20 ppm were carried out for 6 hours per day 5 days a week for a total of 4 to 35 exposures. Conjugated nitro-olefins, particularly 2-nitro-2-butene and 4-nitro-4-nonene, were highly injurious and potent irritants to all rabbits, guinea pigs, rats, and mice exposed, although wide variations were noted. The rats were particularly susceptible; guinea pigs were most resistant.

Similarly, aliphatic nitro compounds (nitroethane 2-nitropropane) inhibit  $O_2$  consumption of isolated leucocytes, alter succinoxidase, cytochrome oxidase, and phosphate metabolism of tissue homogenates, in so intricate a manner that one must, for the present, conclude that a beginning is just being made in unraveling the mechanism of these highly complex toxic responses at the cellular level. These were the findings of Dr. Frances L. Estes, Baylor University College of Medicine, Houston, Tex., and Dr. Joseph L. Gast, Resources Research, Inc., San Mateo, Calif. To such ends it is hoped that useful guides for studies of the systems affected in the intact animal exposed to these pollutants will first be determined by further enzyme studies.

Dr. Donald M. Pace and Dr. James R. Thompson, University of Nebraska, Lincoln, found that HeLa cell growth was significantly modified in tissue culture by levels of 10 ppm ozone for 4 hours, or  $NO_2$  at 5 ppm for 5 days.

No indication of tolerance to these pollutants was noted.

Experimentalists in air pollution research are continually searching for evermore sensitive means of detecting subtle and borderline responses in their experimental hosts. Dr. Robert D. Boche, College of Medical Evangelists, Los Angeles, Calif., reported such a test. Mice exposed to synthetic smog containing an average ozone concentration of 0.51 ppm showed 64 percent reduction in spontaneous wheel-turning activity, but were relatively less affected by the gasoline component which had a threshold of 22 ppm. Although it is realized many factors influence this activity, the method was felt to be a highly sensitive indicator of air pollutant effects. Further work is indicated to relate activity decrease to toxicity.

Another basic question amenable to animal experiment is the relation of continuous to intermittent exposure to air pollutants. Dr. Robert M. Heyssel, Vanderbilt University, Nashville, Tenn., reported that groups of rats subjected to round-the-clock exposures of  $\text{SO}_2$  gas at a series of levels from 1 to 32 ppm showed responses that increased with increasing concentrations. Although the study is not yet finished, it would appear from results thus far that continuous exposure to the respiratory irritant  $\text{SO}_2$  provokes more severe reaction in rats than an equivalent level intermittently. Whether the same exposure duration (concentration time value) intermittently will result in the same response as that from a continuous exposure of equal duration remains to be determined. The possibility of nutritional alteration of the rat diet from continuous  $\text{SO}_2$  exposure should be considered in final appraisal of the results, a variable not as yet eliminated.

Dr. Ralph G. Smith, Wayne State University, Detroit, Mich., reported that exposing laboratory rats and guinea pigs to concentrations of pure phenol vapors as high as 100 ppm produced no unexpected findings. Rats which received intratracheal injections of enriched phenolic complex from the air displayed increased phagocytic activity in the lung, associated with minute pigmented areas and focal granulomata. Similar findings were observed in rats receiving unchanged particulate matter

and the total organic complex from airborne particulate matter. The study is still in progress.

A mechanism involving molecular physics designed to form the base of an understanding of the repeatedly reported synergistic properties of aerosols to intensify or attenuate the toxic or irritant effects of gases and vapors was proposed by Dr. Alexander Goetz, California Institute of Technology, Pasadena. The basic assumption of his theory of synergism is that an accumulation of the toxic gas molecules results from their partial or total adsorption on the surface of the particulates which in turn carry the gas in more concentrated form to the susceptible lung tissue. Whether this synergism acts in the intensifying or attenuating sense depends on whether this type of reaction between gas and particulate is such as to promote or prevent the transfer of the adsorbed gas molecules onto the tissue surface, subsequent to its contact with the particle. The theory is in good agreement with experimental results already obtained in animals. Moreover as predicted from theory (finite number of gaseous adsorption layers) the synergistic effect vanishes for high relative irritant concentrations and increases with increasing aerosol concentrations for low irritant levels.

### *Automotive Exhaust Research*

Dr. W. L. Faith, Air Pollution Foundation, San Marino, Calif., reported on proposed methods for the control of automotive exhaust emissions. Olefinic hydrocarbons, carbon monoxide, and polynuclear hydrocarbons have been indicated as pollutants requiring effective control. Due to the variability of the energy level (combustible concentrations) and oxygen level in the automotive exhaust gases, the most promising method of alleviation is afterburning of the contaminants. Three such systems are under development: direct flame afterburners with heat exchangers, direct flame afterburners with auxiliary fuel, and oxidation catalyst converters. The chief problems facing the developers at present are related to the equipment size, materials of construction, methods for combustion, air addition, maintenance, and replacement requirements and costs.

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## Pathology

Dr. Seymour Farber, University of California Medical Center, San Francisco, described a technique which has great potential as a method for early detection of lung cancer. The technique is dependent on observation of metaplastic cell types in the sputum. These changes have been observed in the sputum of patients both during and following the administration of desoxyribonucleic acid. This technique resembles the Papanicolaou smear technique for cervical carcinoma and its accuracy compares favorably with that of the latter technique. A comparison between percentage of positive cytologic results and percentage of nonpositive cases is being conducted on a series of 300 patients with trysin used as a digestive agent and may be even more productive in positive findings.

Dr. Kenneth P. Knudtson, University of Washington Medical School, Seattle, discussed the relation of environmental factors to pathologic changes in the human trachea and bronchi. Dr. Knudtson's study dealt primarily with epithelial changes in the lung. He has observed alterations of the epithelium manifested as decreased numbers of goblet cells, loss of cilia, and metaplasia of the epithelium, and, particularly in heavy smokers, a secondary stimulation of submucosal glands probably related to metaplasia extending downward from the mucosa, blocking these glands and causing accumulation of secretions. This cellular metaplasia is most severe at the bifurcation of the bronchi and to a lesser degree at lower bifurcations. The location of these changes is explained by ciliary motion concentrating irritants at these particular points. No difference between cases grouped according to residence in urban or rural areas has been observed.

Lung carcinogenicity induced by intratracheally injected radioactive  $\text{BaS}^{35}\text{O}$ , and  $\text{Ce}^{144}\text{F}_3$  was discussed by Dr. Herman Cember, University of Pittsburgh Graduate School of Public Health, Pittsburgh, Pa. Dr. Cember's studies indicate that the time factor during which the radiological insult is administered is an important consideration in determining the carcinogenicity of inhaled radioactive dusts. Barium sulfate, which was cleared out of the rats' lungs

in a matter of days, did not produce lung cancer when given as a single dose of 4,500  $\mu\text{c}$ . Ten small doses of 375  $\mu\text{c}$  each over a 20-week period, however, resulted in bronchogenic carcinoma. Cerium fluoride, on the other hand, which was found to be tenaciously retained in the lungs, produced bronchogenic carcinoma after a single exposure of 4  $\mu\text{c}$ .

A higher incidence of respiratory infection was observed in animals exposed to both radioactive materials than those not exposed. Most of the deaths in these exposed animals occurred within several months following exposure.

Dr. Jerome Kleiner, St. Luke's Hospital, Cleveland, Ohio, and Saranac Laboratory, Saranac Lake, N.Y., reported on pathological changes in the lung induced by inhalation of nitrogen dioxide gas. Preliminary study indicates that the respiratory epithelium reacts similarly to repetitive gaseous exposure as it does to acute exposures, provided the tissues are allowed to recover between exposures.

Clinical observations have shown that animals that recover from acute gassing with high concentrations of nitrogen dioxide suffer from either moderate dyspnea or faint cyanosis immediately after exposure or within 48 hours. However, clinical recovery seems to be complete.

Histologically, accumulation of inflammatory exudate and epithelial proliferation were prominent changes observed in the walls of the respiratory bronchioles and proximal alveolar ducts. The changes appeared to be reversible, with no indication of permanent tissue damage or bronchiolitis obliterans.

## Chemistry

Dr. Amos Turk, department of chemistry, City College, New York City, reported on studies of both fundamental and practical importance concerning sampling of vapors on activated carbon and on the recovery of materials so adsorbed. Of particular interest is his work on the impregnation of carbon with more or less specific reagents to remove certain chemicals which would not otherwise be collected as completely by the carbon. For example, he showed brominated charcoal to have a very high affinity for olefins, including ethylene; charcoal impregnated with sodium silicate will remove hydrogen fluoride with extremely

James M. Chandler, chairman, vehicle combustion products committee, Automobile Manufacturers Association, Detroit, Mich., discussed the automobile industry's recent developments in the control of automotive emissions. Current research on control actively centers on three contaminant sources: the exhaust, the crankcase ventilation, and the fuel systems. Limited success in the reduction of the hydrocarbon and carbon monoxide from the exhaust system has been achieved with oxidation catalytic converters and direct flame afterburners. The problems of warmup time, equipment size and life, and operating dependability and cost are unresolved. Techniques for the reduction of oxides of nitrogen exhaust emissions have not given encouraging results to date.

An inexpensive control device for the elimination of crankcase vent fumes has been developed and will be available on all 1961 American cars on sale in California. Control of hydrocarbon losses from the fuel system is under industry study. Two proposed solutions being investigated are the use of less volatile fuels and the use of mechanically sealed fuel systems.

William E. Scott, Scott Research Laboratories, Inc., Perkasi, Pa., reported on the progress in the development of catalysts for the reduction of nitric oxides in the exhaust by the carbon monoxide or hydrogen components in the exhaust or both. Zinc-copper chromite, iron chromite, barium-promoted copper chromite, and chromium-promoted iron oxides were indicated as efficient catalysts for removing nitric oxide from synthetic mixtures by reaction with carbon monoxide at temperatures of 220° to 320° C. Chromites possibly would also induce oxidation of hydrocarbons and carbon monoxide in the presence of excess oxygen. Experiments using actual exhausts are continuing in order to establish the effectiveness of the catalysts in both leaded and unleaded fuels.

Joseph Grumer, Explosive Research Laboratory, U.S. Bureau of Mines, Pittsburgh, Pa., reported on the feasibility of using ducted diffusion flames in automotive exhaust afterburners. Exploratory experiments using simulated idle exhaust gases indicate that diffusion flames have wider flame stability limits than rich semidiffusion and slightly lean premixed

flames. If, therefore, the high temperature of the exhaust gases as they are discharged from the engine is employed, complete premixing of the exhaust gases and combustion air prior to burning is undesirable. Tests indicate that under the conditions of the experiment, carbon monoxide and saturated hydrocarbon (butane) were completely burned, a small percentage of the hydrogen remained, and the unsaturated hydrocarbon (isobutylene) was reduced by about 80 percent.

Dr. Robert B. Anderson, Central Experiment Station, U.S. Bureau of Mines, Pittsburgh, Pa., described studies using metal oxide catalysts for the oxidation of automotive exhaust hydrocarbons. A variety of pure metal oxides and supported catalysts are being evaluated. Oxides impregnated on robust alumina indicate, in order of decreasing activity, that chromium, manganese, vanadium, iron, uranium, copper, and cobalt are effective in hydrocarbon removal.

Tests employing automotive engine exhaust have been used in the evaluation of the robust catalyst supports and to examine surface deposits from leaded gasolines. Spherical pellets of  $\gamma$ -alumina meet most of the requirements for a catalyst support.

Dr. Patrick J. Lawther, Medical Research Council, Dunn Laboratories, St. Bartholomew's Hospital, London, discussed pollution of the atmosphere by carbon monoxide, oxides of nitrogen, smoke, and polycyclic hydrocarbons from automotive exhaust. This study emphasized the effect on the ambient air as measured in garage areas, low-level street areas, and vehicular tunnels. The garage area studies indicated that diesel buses contributed insignificant amounts of polycyclic hydrocarbons and the levels of carbon monoxide and oxides of nitrogen were well below maximum allowable concentrations. The tunnel studies, designed to evaluate the effect on the atmosphere of all types of vehicles under varying conditions of load and maintenance, indicated concentrations of polycyclic hydrocarbons equivalent to those found in the urban air in the winter months. Carbon monoxide concentrations measured at street level reached values as high as 350 ppm. Work with this latter contaminant will be continued.

sence of molecular oxygen but at a pressure of 1 atmosphere, however, the reaction products from butadiene were almost entirely butadiene monoxide and 3-butenal.

### **Community Studies**

Dr. John J. Phair, University of Cincinnati, Cincinnati, Ohio, reported on the design of epidemiological investigations of community air pollution. Dose, resistance, and response must be defined in reasonably exact terms in any epidemiological investigation of the health effects of air pollution. Data analysis must also make provision for adjustment of variation in degree and time in pollutant concentration. Epidemiological investigations do not replace but supplement the work being done in industrial plants, experimental laboratories, and community surveys.

Dr. Robert Lewis, Tulane University, New Orleans, La., discussed the methods and results of the New Orleans asthma study. Admissions for emergency asthma treatment were correlated with local meteorological data. Results to date suggest there might be more than one cause and more than one potential point source, as indicated by differences in outbreak episodes as related to atmospheric conditions, age groups affected, and the geographic distribution of cases.

Victor Sussman, Pennsylvania Department of Health, Harrisburg, discussed methods of establishing a statewide air sampling system. Three approaches were considered: a random sampling method with some bias toward problem areas, maintenance of sampling equipment for emergency use or specific studies, and area and community studies involving sampling, source inventories, and calculations of area pollution levels. Two years of evaluation of the three surveillance methods has demonstrated the advantages of surveys in which most of the data come from source inventories. Sampling equipment maintained in seven State regional offices was used successfully for specific studies or in emergencies. Random sampling was found not to be practical.

Dr. Louis Zeidberg, Vanderbilt University,

Nashville, Tenn., discussed the general aspects and medical phase of the Nashville air pollution study. The Nashville project, a joint engineering and medical investigation, was set up to gain knowledge on the methodology of measuring air pollutants in an urban community and to assess health effects of the various measured pollutants on the people of the community. The objectives, plan of study, and methods of data analysis of the morbidity, mortality, cardio-respiratory disease, and anthracosis studies were described.

Jean Schueneman, Public Health Service, Cincinnati, Ohio, described the engineering aspects of the Nashville study. Aerometric studies were discussed in terms of objective, equipment used, and analytical methods employed. Other activities were outlined, including preparation of a sulfur dioxide emission inventory, sampling of public opinion on air pollution, and forecasting of pollution levels.

Dr. Jan Lieben, Pennsylvania Department of Health, Harrisburg, discussed cases of beryllium disease which have been reported in areas adjacent to beryllium refineries and fluorescent light bulb plants. These cases were in persons living in the neighborhood of the plant without exposure either occupationally or through contact with contaminated clothing brought home for washing. The author accepts the level of 0.01 microgram of beryllium per cubic meter as the safe limit for outdoor concentrations.

Dr. John R. Goldsmith of the California State Department of Public Health, Berkeley, discussed the development of California's air pollution standards. In preparing the 1959 standards for ambient air quality, the department of public health set up three levels based on qualitatively different effects. The levels were designated "adverse," "serious," and "emergency." The procedure for setting up a standard was dissimilar from standard-setting for industrial exposure in a number of other ways. For example, the aim was to protect the most sensitive group of persons in the community, provided the group was definable in terms of age or medical status.

high efficiency. Other factors mentioned were techniques for recovery of sorbed material, the removal of water from collected materials, and the nature of the so-called "carbon odor."

The results of sampling with another technique, this time for particulate matter, were presented by Dr. Alexander Goetz, professor of physics, California Institute of Technology, Pasadena. Dr. Goetz has been sampling natural aerosols at sea, in the mountains, on the deserts, and in forests. Under appropriate conditions, he found all of these aerosols, as collected with the "aerosol spectrometer," to contain a large fraction of material which is volatile on standing. Humidity conditions seem to have little effect on this volatility. The results probably indicate that nature is fully capable of producing substantial concentrations of organic particulate matter without human assistance and that these particles are not in a stable equilibrium with the air in which they are suspended.

One of the problems facing the chemist who seeks to identify organic air pollutants is the fact that the atmosphere seems able to synthesize compounds which the organic chemist has not yet made and characterized. Dr. Frank A. Vingiello, Virginia Polytechnic Institute, Blacksburg, is engaged in filling the gaps in one particular class of compounds, the substituted dibenzopyrenes. He has successfully synthesized a number of methylated dibenzopyrenes by an unequivocal route. These have been characterized by melting point, spectral behavior, and related physical means.

Two papers were concerned with various aspects of the chemistry of oxidizing atmospheres of the type characteristic of Los Angeles. Dr. Jack G. Calvert, professor of chemistry, Ohio State University, Columbus, discussed the reaction of methyl radicals with oxygen. His work shows that this system is capable of generating ozone without the presence of nitrogen oxides. Since methyl radicals can be generated by the photolysis of a number of types of organic substances, this offers an alternate route to smog formation which does not involve the original mechanism postulated by Haagen-Smit. The end products of this particular reaction chain were methyl alcohol and formaldehyde. This is of further interest because of the

present opinion that formaldehyde may be at least one of the substances responsible for eye irritation in the Los Angeles atmosphere.

Photochemical research of still more direct application for the air chemist was presented by Dr. Robert R. Austin, Robert R. Austin Laboratories, San Gabriel, Calif. The apparatus which has been used up to this time for the determination of the so-called "oxidant precursor" has been extremely bulky, and has posed serious problems of power consumption, heat dissipation, and time delay in recording changes in this parameter. Dr. Austin has designed a much smaller chamber giving similar results with one-tenth the power output and approximately one-fifth the residence time. The two types of chamber do have differences in their behavior toward individual hydrocarbons.

Initial results with an apparatus which simulates more closely the actual conditions of the atmosphere were reported by Dr. Lyman A. Ripperton, department of sanitary engineering, University of North Carolina, Chapel Hill. While his results shed little light on the intimate details of atmospheric reaction mechanisms, they showed that at least some of the oxidative processes of the atmosphere can lead to the formation of compounds of much higher unsaturation than those initially present. Largely using visible light, he irradiated mixtures of nitrogen dioxide and 1-hexene. The products appeared to include acetylenic compounds. Even more surprising, there was some evidence that aromatization had occurred; the products gave positive tests which indicated the presence of phenols. Possible physiological action of the products was studied by the use of the micro-organism *Serratia marcescens*. However, consistent results have not yet been obtained.

Dr. R. J. Cvetanović, National Research Council of Canada, Ottawa, reported on the reactions of oxygen atoms, which are known to be formed in the atmosphere by the photolysis of nitrogen dioxide with butadiene as well as with a number of other olefinic materials. His results suggested that under normal atmospheric conditions, the products of this atomic oxygen attack could well be indistinguishable from those of reaction with ozone. In the ab-



# Federal Publications

**Research Highlights in Aging.** *PHS Publication No. 779; 1960; 52 pages; 25 cents.*

Approximately 50 selected papers on research in aging carried out or supported by the National Institutes of Health, Public Health Service, during 1959 are reviewed.

This booklet should appeal especially to those interested in details of aging changes in organic structure and function and their implications for research. The study subjects range from individuals and populations, organs and organ systems, tissues, and cells to subcellular structures and activities.

A reference list alphabetized according to principal investigator is included.

**Nutrition and Food Service in Nursing Homes and Homes for the Aged.** Selected references. *PHS Publication No. 786 (Public Health Bibliography Series No. 31); 1960; 11 pages; 15 cents.*

Directed to nutritionists, dietitians, nurses, and health department personnel, this annotated bibliography presents information on nursing homes, food habits and nutrition for older people, and provision of dietary consultation and nutrition services to institutions.

Pertinent food service and diet manuals developed by State health departments and dietetic associations, as well as other publications, are described.

**Activities of the National Institutes of Health in the Field of Gerontology.** *PHS Publication No. 761; 41 pages; 30 cents.*

Research grant and training projects active on January 31, 1960, and intramural research projects conducted during calendar year 1959 are divided into two groups according to whether they are related primarily or secondarily to aging.

A total of 580-odd projects are listed. They deal with general gerontology, major multidisciplinary research projects, identifiable disease

processes, training, and structural, physiological, biological, psychological, and social aspects of aging.

The institute or division responsible for each grant is designated and principal investigators are indexed.

**Digest of Prepaid Dental Care Plans, 1960.** *PHS Publication No. 585; revised 1960; by W. J. Pelton and J. C. Rowan; 103 pages.*

All prepaid dental care plans known to be operating in the spring of 1960 are described briefly. Data are included on areas served, year established, number of enrollees, whether service or indemnity benefits, methods of operation, eligibility requirements, benefits offered and excluded, and method of financing.

Separate sections summarize information on benefits under Blue Cross and Blue Shield and list existing statewide dental service corporations.

**The Mongoloid Baby.** *Children's Bureau Folder No. 50—1960; 20 pages; 10 cents.*

One of a series for parents who have children with handicapping conditions, this booklet tells what is known about mongolism and advises parents of a mongoloid baby on the kinds of adjustments they may need to make. It points out some of the decisions parents must make, warning against hasty actions which might ignore the needs of the baby or his effect on his parents or other children in the family.

Some of the sources of help provided by the community and the State are given.

**School Health.** Selected references. *PHS Publication No. 799 (Public Health Bibliography Series No. 32); 1960; 10 pages.*

Selected texts and brochures, including publications of governmental and voluntary agencies and commercially printed material, on school-community health programs and administration are listed.

Phases covered include dental and mental health in schools, college health education, physical education

and fitness, administration and policy, roles of the school nurse and the teacher, and reports of inter-agency conferences.

**The Impact of Asian Influenza on Community Life.** A study in five cities. *PHS Publication No. 766; 1960; by Irwin M. Rosenstock, Godfrey M. Hochbaum, Howard Leventhal, and others; 98 pages.*

Five research papers report effects of the Asian influenza epidemic on community agencies, selected industries, general population, physicians, nurses, pharmacists, and hospitals. Findings of a sero-epidemiological study are also given.

Study conclusions have implications for planning National, State, and local public health programs.

**Control of Domestic Rats and Mice.** *PHS Publication No. 563; revised 1960; 26 pages; 25 cents.*

Rodent-borne diseases, identification of domestic rats and mice, habits of these rodents and signs of their presence, and control methods are reviewed.

Detailed instructions for using poisons describe the characteristics of rodenticides and discuss bait formulas, bait placement, and prebaiting. Techniques for trapping rodents and gassing burrows and methods of ratproofing and ectoparasite control are outlined.

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This section carries announcements of new publications prepared by the Public Health Service and of selected publications prepared with Federal support.

Unless otherwise indicated, publications for which prices are quoted are for sale by the Superintendent of Documents, U.S. Government Printing Office, Washington 25, D.C. Orders should be accompanied by cash, check, or money order and should fully identify the publication. Public Health Service publications which do not carry price quotations, as well as single sample copies of those for which prices are shown, can be obtained without charge from the Public Inquiries Branch, Office of Information, Public Health Service, Washington 25, D.C.

The Public Health Service does not supply publications other than its own.

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## *Radioactive Material in Bank Vaults*

In March 1959, a representative of banking interests in the city of Seattle came to the Seattle-King County Department of Public Health with a letter from a prominent radiologist. The letter, dated February 18, 1959, ran as follows:

Dear ———:

Something has again come to our attention which I think might be of interest to the banking community. Twice, within approximately a year's period, we have had calls for information regarding radium which has been stored by private persons in a safety deposit box in the local bank. These have been people who have obtained radium in an estate, and knowing nothing better to do with it, have put it in the vault together with other valuables. This week, a very significant quantity of radium was removed from a safety deposit box in a Seattle bank where it had been since approximately 1915. Just as a community service for safety, we volunteered that we would store the radium in our radium safe here at the hospital until the person learned what she should do with it. At least it got it out of the bank vault where there is a general hazard to those who are around the bank vault continuously, and takes the radium out of her hands and any handling of it further.

I call this to your attention. I thought perhaps you would like to call it to the attention of the banking association locally. I would suppose that there are certain items that are prohibited in safety deposit boxes, but perhaps radium is not an item which had been thought of. Maybe there is more than one would think. On the other hand, there may be no more stored in Seattle banks, but it would be my guess that there is. In both instances, these quantities of radium were part of the estate of a physician who had died, and there was no sale for it at the time. Hence, as a valuable, it was stored.

Let me say that there is no acute emergency about this problem, but if the banks so desired, a Geiger counter survey of bank vaults could well find any radium which was stored there.

About 6 months before this letter was written, the health department had recruited a Radiological Health Technical Advisory Committee, with the mission of assisting the department in technical matters relating to local surveillance of radiation hazards. The committee includes a radiological

physicist from a local hospital, radiological safety officers from a large industrial organization and the University of Washington, and an engineer engaged in radiation control work with the State department of health. This group concurred in the radiologist's recommendation for a survey.

A bank equipment sales and service company volunteered to perform the survey during the course of its routine service visits to the vaults. With the help of the technical advisory committee, a suitable device was procured for field testing, and personnel were instructed in its use. The survey began in May 1959 and continued through January 1960. For a nominal fee, each institution with a vault was offered the Geiger counter inspection service. Only 3 out of a total of 71 vaults refused this offer (4.2 percent).

A standard procedure for vault inspection was developed. The average background radiation in the surveyed vaults ranged between 0.005 and 0.01 milliroentgens per hour. These results are considered within normal limits; no additional radium or other radioactive material was found.

Radium, as used by physicians of an earlier era and the type likely to be uncovered, was packaged in such a way that the passing of time could permit escape of highly toxic radon gas generated by the decay of radium. Persons exposed to this radiological health hazard are probably few in number. Individuals who are now being exposed, albeit inadvertently, would find small consolation in the fact that their jeopardy is shared by only a few. However, so far as the health department has been able to determine, this is the first such survey made. There is comfort in the assurance that in this relatively young community of more than 800,000 persons, no additional radium was found. The probability of finding radium in bank vaults is unquestionably higher in some of the older and larger metropolitan communities.—D. R. PETERSON, M.D., *director of adult health division, Seattle-King County Department of Public Health.*

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